

## 6 HIGH-SPEED TRAIN ALIGNMENT OPTIONS COMPARISON

### 6.1 INTRODUCTION

#### 6.1.1 Purpose and Content of this Chapter

The purpose of this chapter is to summarize and compare the physical and operational characteristics and potential environmental consequences associated with the high-speed train (HST) alignment and station options. The comparison focuses on subject areas in which there are relative differences among the potential impacts of the various HST station and alignment options in each segment of the proposed system. This chapter summarizes potential environmental consequences for each alignment comparison for the environmental resource areas where relative differences were identified. (Refer to Chapter 3, *Affected Environment, Environmental Consequences, and Mitigation Strategies*, for a comprehensive presentation of potential environmental consequences in each environmental resource area.)

For many of the environmental topics discussed in this chapter, the quantities presented represent areas within which potential impacts might occur. For example, the area of floodplains includes all floodplains within 100 feet (ft) (30.5 meters [m]) of either side of the centerline of the alignment considered; whereas the right-of-way necessary for the improvements considered is smaller (e.g., only 25 ft [7.6 m] on either side of the centerline for the HST Alternative). Therefore the magnitude of potential impacts reported in this document is considerably larger than the actual impacts that would be expected from either the HST or Modal Alternative.

#### 6.1.2 Organization of this Chapter

This chapter is organized by study region. From north to south, the five study regions are Bay Area to Merced, Sacramento to Bakersfield, Bakersfield to Los Angeles, Los Angeles to San Diego via Inland Empire, and Los Angeles to San Diego via Orange County (LOSSAN). For each region, the alignment option comparisons are presented in tabular form by segment. The station options are presented individually and compared where multiple options are considered for the same general station area. The alignment and station options are briefly described in the tables and illustrated on the associated maps. For each alignment comparison, the following summary information is presented and compared where relative differences were identified.

- Physical/operational characteristics.
  - Alignment.
  - Length.
  - Capital cost.
  - Travel time.
  - Ridership.
  - Constructability.
  - Operational issues.
- Potential environmental impacts.
  - Transportation and related topics (air quality, noise and vibration, and energy).
  - Human environment (land use and community impacts, farmlands and agriculture, aesthetics and visual resources, socioeconomics, utilities and public services, hazardous materials and wastes).

- Cultural resources (archaeological resources, historical properties) and paleontological resources.
- Natural environment (geology and seismic hazards, hydrology and water resources, and biological resources and wetlands).
- Section 4(f) and 6(f) resources (certain types of publicly owned parklands, recreation areas, wildlife/waterfowl refuges, and historical sites).

## 6.2 BAY AREA TO MERCED REGION

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

### 6.2.1 Bay Area to Merced Alignment Options

#### A. SAN FRANCISCO TO SAN JOSE ALIGNMENT OPTIONS

All information presented is for the area from San Francisco to San Jose. This segment is shown in Figure 6.2-1.

Caltrain Corridor	
Physical/Operational Characteristics	
<b>Alignment Description</b>	From San Francisco to San Jose, this alignment would use the existing Caltrain rail right-of-way. This option assumes that the HST would share tracks with express Caltrain commuter trains. The entire alignment would be four tracks and completely grade separated. Station options considered in this segment include Transbay Terminal, 4th and King, Millbrae, Redwood City, Palo Alto, and San Jose Diridon.
<b>Length in miles (km)</b>	47–48 mi (76–77 km)
<b>Cost (dollars)</b>	\$3.54 billion <sup>1</sup>
<b>Travel Time (min)</b>	27–30 min (depending on terminal station)
<b>Ridership</b>	This alignment would directly serve downtown San Francisco and San Francisco International Airport (SFO) and would have high ridership and revenue potential. Downtown San Francisco to downtown Los Angeles HST travel times could be accomplished in less than 2.5 hrs.
<b>Constructability</b>	Maintaining operations on the existing commuter rail service while constructing grade separations, tunnels, elevated sections, and stations would involve major construction issues/challenges. However, the infrastructure improvements could be constructed incrementally.
<b>Operational Issues</b>	Average speed = 104 mph (167 kph) Maximum speed = 93–124 mph (150–200 kph) HST operations would need to be coordinated and integrated with Caltrain service. The two middle tracks would be shared by HST and Caltrain, so some of the line capacity would be used for commuter services. Sharing tracks with commuter trains could increase the potential for HST delays.

<sup>1</sup> Includes terminal at 4th and King. Does not include segment cost from 4th Street to Transbay Terminal or station cost for the Transbay Terminal.

Caltrain Corridor	
Potential Environmental Impacts	
<b>Travel Conditions</b>	The Caltrain corridor alignment would bring direct HST service up the San Francisco Peninsula to downtown San Francisco with potential stations in downtown San Francisco, at SFO (Millbrae), a mid-Peninsula station at either Redwood City or Palo Alto, and a potential San Jose International Airport (SJC) link at Santa Clara. This alignment would increase connectivity and accessibility to San Francisco, the Peninsula, and SFO, the hub international airport for northern California. The HST system would provide a safer, more reliable, energy efficient intercity mode along the San Francisco Peninsula while improving the safety, reliability, and performance of the regional commuter service. The HST alignment would greatly increase the capacity for intercity and commuter travel and reduce existing automobile traffic. The fully grade-separated Caltrain corridor would improve local traffic flow and reduce air pollution at existing rail crossings.
<b>Noise and Vibration:</b> <sup>2</sup> High, medium, or low potential impacts	Medium potential impacts. Dense urban area surrounding land uses.  The HST would travel at speeds less than 125 mph (201 kph) along this alignment. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	Compatibility: Highly compatible Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: Low potential impacts  Alignment would be almost completely within the existing Caltrain right-of-way.
<b>Aesthetics and Visual Resources:</b> Number of potential viewing points and potentially high contrast/impact areas	Low potential impacts.  Shared use of existing Caltrain right-of-way would reduce potential visual impacts. Elevated portions of alignment would have potential visual impacts.
<b>Cultural Resources and Paleontological Resources:</b> <sup>3</sup> Potential presence of historical resources in area of potential effect	22–23 known cultural resources  It is estimated that the Caltrain alignment (established in the 1860s) has many historical resources and historical districts.

<sup>2</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, may be affected.

<sup>3</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

Caltrain Corridor	
<b>Hydrology and Water Resources:</b> <sup>4</sup> Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 200 ac (81 ha) Streams: 73,026 linear ft (22,258 linear m)  The stream crossings encroached upon by the existing Caltrain right-of-way are channeled and highly developed. Alignment would be almost completely within the existing Caltrain right-of-way.
<b>Biological Resources Including Wetlands:</b> <sup>5</sup> Ac (ha) of wetland and ac (ha) of special-status species habitat within potential impact study areas	Wetlands: 9,627 ac (3,896 ha) Special-status species habitat: 8,269 ac (3,346 ha)  Shared use of existing Caltrain right-of-way would reduce potential wetlands and wildlife impacts. Alignment would be almost completely within the existing Caltrain right-of-way.
<b>Section 4(f) and 6(f) Resources:</b> <sup>6</sup> Number of resources rated high potential direct effects	Resources rated high: 0  Few potential impacts if any expected because alignment is almost completely within existing right-of-way.

<sup>4</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>5</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>6</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

## B. OAKLAND TO SAN JOSE ALIGNMENT OPTIONS

All information presented is for the area from Oakland to San Jose. This segment is shown in Figure 6.2-2.

Hayward/Niles/Mulford Line		Hayward Line to I-880
Physical/Operational Characteristics		
<b>Alignment Description</b>	This is the alignment currently used by the Capitol intercity rail service. From Oakland, this alignment would travel south along the Union Pacific Railroad (UPRR) Hayward Line to the UPRR Niles Line (Union City to Newark) and then onto the UPRR Mulford line (Newark to San Jose). Station options considered in this segment include West Oakland, 12th Street, Coliseum BART Station, Union City, Auto Mall Parkway, and San Jose Diridon.	From Oakland, this alignment would travel south following the UPRR Hayward rail line and then transition to the median of I-880. Between Fremont and San Jose, the alignment would be primarily on an aerial structure in the freeway median. Station options considered in this segment include West Oakland, 12th Street, Coliseum BART Station, Union City, and San Jose Diridon.
<b>Length in miles<sup>7</sup> (km)</b>	46 mi (74 km)	42 mi (68 km)
<b>Cost<sup>8</sup> (dollars)</b>	\$3.16 billion	\$3.30 billion
<b>Travel Time<sup>9</sup> (min)</b>	27 min	21 min
<b>Ridership</b>	Would have less potential ridership than the I-880/Hayward Line option.	Shortest travel times and highest ridership potential.
<b>Constructability</b>	Major construction issues associated with construction through Don Edwards San Francisco Bay National Wildlife Refuge (Don Edwards Wildlife Refuge).	Major construction issues associated with constructing columns and footings in the wide median of I-880 (between San Jose and Fremont), and the tunnel under the lake in Fremont Central Park.
<b>Operational Issues</b>	Average speed = 101–103 mph (163–166 kph) Maximum speed = 124–155 mph (200–249 kph) Greater potential for shared tracks with Capitol Rail Service. Potential conflict with UPRR freight access and operations.	Average speed = 116–120 mph (187–193) Maximum speed = 124–155 mph (200–249 kph) Potential conflict with UPRR freight access and operations from Oakland to Union City.

<sup>7</sup> Includes West Oakland terminal station.

<sup>8</sup> Includes West Oakland terminal station.

<sup>9</sup> Includes West Oakland terminal station.

Hayward/Niles/Mulford Line		Hayward Line to I-880
Potential Environmental Impacts		
<b>Travel Conditions</b>	<p>The Hayward/Niles/Mulford Line is a longer route and has tight curves that severely restrict speeds between Fremont and Union City. The line would serve additional potential station sites at Fremont (Auto Mall Parkway) and SJC (Santa Clara).</p> <p>The Oakland to San Jose alignments would bring direct HST service up the East Bay to Oakland with potential stations in Downtown Oakland or West Oakland, at Oakland International Airport (OAK) (Oakland Coliseum), and a potential southern Alameda County station at either Union City or Fremont (Auto Mall Parkway). These alignments would increase connectivity and accessibility to Oakland, the East Bay, and OAK. The HST system would provide a safer, more reliable, energy efficient intercity mode directly to the East Bay while improving the safety, reliability and performance of the existing Capitol intercity service (Sacramento to San Jose via I-80) through grade separation improvements between Oakland and San Jose. The HST alignment would increase the capacity for intercity travel in the East Bay and reduce highway congestion. Grade separations on the existing adjacent Mulford Line would improve traffic flow and reduce air pollution at existing grade crossings.</p>	<p>The I-880 alignment would provide shorter travel times to connect the HST system to the East Bay compared to the Mulford Line. For all potential markets to Oakland, the I-880 corridor would permit express and local travel times of about 6 min less than the Mulford Line. Travel times for the I-880 corridor between Oakland and Los Angeles could be 2 hrs 18 min, compared to at least 2 hrs 24 min for the Mulford Line.</p> <p>The Oakland to San Jose alignments would bring direct HST service up the East Bay to Oakland with potential stations in Downtown Oakland or West Oakland, at OAK (Oakland Coliseum), and a potential South Alameda County station at either Union City or Fremont (Auto Mall Parkway). These alignments would increase connectivity and accessibility to Oakland, the East Bay, and OAK. The HST system would provide a safer, more reliable, energy efficient intercity mode directly to the East Bay while improving the safety, reliability and performance of the existing Capitol intercity service (Sacramento to San Jose via I-80) through grade separation improvements between Oakland and Union City. The HST alignment would greatly increase the capacity for intercity travel in the East Bay and reduce highway congestion.</p>
<b>Noise and Vibration:</b> <sup>10</sup> High, medium, or low potential impacts	<p>Medium potential impacts. Potential impacts on wildlife at Don Edwards Wildlife Refuge.</p> <p>There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.</p>	<p>High potential impacts.</p> <p>Would add noise to the grade-separated highway corridor through densely populated communities.</p>

<sup>10</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Hayward/Niles/Mulford Line	Hayward Line to I-880
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	Compatibility: Inconsistent with park use at Don Edwards Wildlife Refuge Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: High compatibility Environmental Justice: Low potential minority population impacts Community: Low potential impacts Property: High potential impacts
<b>Aesthetics and Visual Resources:</b> Number of potential viewing points and high contrast/impact areas	High potential impacts. Four viewing points through historic town of Niles.  High contrast of elevated guideway with historic towns (Niles and Alviso) and scenic canyon (Niles). Potential impacts on Don Edwards Wildlife Refuge.	Medium potential impacts. Aerial structure in median of I-880.
<b>Cultural Resources and Paleontological Resources:</b> <sup>11</sup> Potential presence of historical resources in area of potential effect	22–23 known cultural resources.  Both options have high percentages of historical development and apparent potential to affect historical architecture. The Hayward/Niles/Mulford line would potentially impact the Alviso Historical District.	22–23 known cultural resources.  Both options have high percentages of historical development and apparent potential to affect historical architecture.
<b>Hydrology and Water Resources:</b> <sup>12</sup> Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 206 ac (83 ha) Streams: 197,031 linear ft (60,055 m)  Streams crossed are sensitive estuaries with fringing coastal salt marsh at the southern end of San Francisco Bay. Potential impacts on estuaries would be reduced by use of aerial structures.	Floodplains: 180 ac (73 ha) Streams: 121,225 linear ft (36,949 m)  Elevated structure in freeway median would have fewer potential water impacts than the Hayward/Niles/Mulford line through the Don Edwards National Wildlife Refuge.

<sup>11</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

<sup>12</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.



	Hayward/Niles/Mulford Line	Hayward Line to I-880
<b>Biological Resources Including Wetlands:</b> <sup>13</sup> Ac (ha) of wetland and number of special-status species habitat within potential impact study areas	<p>Wetlands: 1,357 ac (549 ha) Species: 19</p> <p>Alignment would traverse 4 mi (6 km) of Don Edwards Wildlife Refuge, a major wildlife and bird sanctuary. Would potentially impact habitat for special-status shorebirds and waterfowl, including the endangered California clapper rail. Wetlands and tidal salt marsh support endangered species such as the salt marsh harvest mouse, steelhead, western snowy plover, and California red-legged frog.</p>	<p>Wetlands: 464 ac (188) Species: 11</p> <p>Eastern alignment in freeway median would avoid potential impacts on Don Edwards Wildlife Refuge and reduce potential wetlands and wildlife impacts.</p>
<b>Section 4(f) and 6(f) Resources:</b> <sup>14</sup> Number of resources rated high potential direct effects	<p>Resources rated high: 4</p> <p>Alignment crosses Don Edwards Wildlife Refuge.</p>	<p>Resources rated high: 7</p> <p>Resources are primarily local parks. Alignment would include tunneling under the lake at Fremont Central Park.</p>

<sup>13</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>14</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

## C. SAN JOSE TO MERCED ALIGNMENTS

All information presented is for the area from San Jose to the intersection of the north-south oriented alignment options in the Central Valley near Merced. This segment is shown in Figure 6.2-3.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
<b>Physical/Operational Characteristics</b>					
<b>Alignment Description</b>	From San Jose, this alignment would use the Caltrain corridor to just north of SR-85, turning east through the Diablo Range to the Central Valley north of Merced. This alignment would be north of Henry Coe State Park and cross a section of SR-130. No station options considered in this segment.	From San Jose, this alignment would use the Caltrain corridor to just north of SR-85, turning east through the Diablo Range to the Central Valley north of Merced. This alignment would traverse through 8.2 mi (13.2 km) of Henry Coe State Park (2.6 mi [4.2 km] in tunnel and 5.6 mi [9.0 km] at grade). No station options considered in this segment.	From San Jose, this alignment would use the Caltrain corridor to just north of SR-85, turning east through the Diablo Range to the Central Valley north of Merced. This alignment would tunnel under 5.9 mi (9.5 km) of Henry Coe State Park. No station options considered in this segment.	From San Jose, this alignment would use the Caltrain corridor through Gilroy. The alignment would use the Pacheco Pass (in the vicinity of SR-152) to the Central Valley south of Merced. Station options considered in this segment include Gilroy and Los Banos.	From San Jose, this alignment would use the Caltrain corridor through Morgan Hill. The alignment would use the Pacheco Pass (in the vicinity of SR-152) to the Central Valley south of Merced. Station options considered in this segment include Morgan Hill and Los Banos.
<b>Length in miles (km)</b>	88 mi (142 km); 19 mi (31 km) of tunnel	86 mi (138 km); 16 mi (26 km) of tunnel	86 mi (138 km); 20 mi (32 km) of tunnel	117 mi (188 km); 10 mi (14 km) of tunnel	116 mi (187 km); 12 mi (14 km) of tunnel
<b>Cost (dollars)<sup>15</sup></b>	\$4.45 billion	\$4.52 billion	\$4.66 billion	\$4.35 billion	\$4.57 billion
<b>Travel Time (min):</b> (San Jose to Sacramento and San Jose to Los Angeles) Based on optimal express travel times.	San Jose to Merced: 34 min  San Jose to Sacramento: 50 min  San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 32 min  San Jose to Sacramento: 50 min  San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 32 min  San Jose to Sacramento: 50 min  San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 40 min  San Jose to Sacramento: 1 hr and 15 min  San Jose to Los Angeles: 1 hr 54 min	San Jose to Merced: 40 min  San Jose to Sacramento: 1 hr and 15 min  San Jose to Los Angeles: 1 hr 54 min

<sup>15</sup> Cost of Diablo Range Direct Options is estimated from San Jose Diridon Station to junction of UPRR near the Town of Dehli. Cost of Pacheco Pass Options is estimated from San Jose Diridon Station to Junction of UPRR near the Town of Chowchilla.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
Ridership	In comparison to the Business Plan (low-end) forecasts, total ridership was estimated to be about 0.5% less than Pacheco Pass options (150,000 annual passengers) and revenue was estimated to be 0.1% less (\$900,000 less annually). Diablo Direct options would have higher ridership between Sacramento/Northern San Joaquin Valley and the Bay Area, but would have lower ridership between the Bay Area and Los Angeles since there would be no station in south Santa Clara County.			Pacheco Pass options would have less ridership between Sacramento/Northern San Joaquin Valley and the Bay Area, but would have higher ridership between the Bay Area and Los Angeles since there would be a potential South Santa Clara County station.	
Constructability	The northern tunnel alignment would cross SR-130 at the middle of the Diablo Range crossing, providing better construction access than other Diablo Range options.	The nearest road to the minimize tunnel alignment through the Diablo Range is SR-130, which is about 5.5 mi (8.9 km) north of the alignment. This alignment would need less tunneling than the other two.	The nearest road to the minimize tunnel alignment through the Diablo Range is SR-130, which is about 5 mi (8 km) north of the alignment.	The Pacheco Pass options are in the vicinity of SR-152 and have better highway access than the Diablo Range Direct options. These alignments would need less tunneling than the Diablo Direct alignments. These alignments would share right of way with Caltrain from Gilroy north.	
Operational Issues	Average speed = 153–162 mph (246–261 kph) Maximum speed = 186–217 mph (299–349 kph)  Diablo Range Direct options would have somewhat lower (approximately 25% lower annually) operational and maintenance costs as a result of fewer total mi of HST system than the Pacheco Pass options.			Average speed = 172–174 mph (277–280 kph) Maximum speed = 186–217 mph (299–349 kph)  Pacheco Pass options would have somewhat higher operational and maintenance costs than Diablo Range Direct options.	
Potential Environmental Impacts					
Travel Conditions	The Diablo Range Direct alignments would be shorter between the San Francisco Bay Area and Sacramento/northern San Joaquin Valley (including Stockton and Modesto) than the Pacheco Pass options, with shorter travel times between these markets. For example, for express trains between Sacramento and San Jose, the Diablo Range northern alignments travel times would be about 25 min less than the Pacheco pass (50 min for the Diablo alignments compared to 1 hr and 15 min for the Pacheco Pass). The Diablo Range Direct options would permit express travel times between Sacramento and San Francisco in 1 hr and 20 min compared to 1 hr and 45 min via the Pacheco Pass options.  The Diablo Range Direct options would also provide quicker and potentially more frequent service to Merced. Travel times are estimated to be 6 or 8 min less			The Pacheco Pass alignment options include potential stations at Gilroy (or Morgan Hill) and Los Banos, whereas the Diablo Range alignments would not have any stations between Merced and San Jose. The populations that would be served by the Gilroy and Los Banos stations would therefore have shorter access times and lower access costs to the nearest HST station for the Pacheco Pass alignments. The potential Gilroy/Morgan Hill station has a particularly high potential impact on connectivity, travel times, and access costs since, in addition to serving southern Santa	

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
	between Merced and San Jose. Moreover, since the Diablo Range Direct options serve Merced from the north, Merced would be on the San Francisco to Los Angeles segment of the HST system and Would likely result in a higher frequency of travel for Merced to/from the Bay Area and Southern California.			Clara County, it would also be the most accessible station location for serving the Santa Cruz, Monterey/Carmel, and Salinas populations. These populations would have better connectivity to the Gilroy station site (Pacheco Pass via Gilroy) than the Morgan Hill site (via Gilroy Bypass). This corridor also has a longer shared corridor with Caltrain, which would benefit commuter travel from Gilroy to the Bay Area.	
<b>Noise and Vibration:</b> <sup>16</sup> High, medium, and low potential impacts	<p>Medium potential impacts—San Jose to Diablo Jct.</p> <p>Low potential impacts—Diablo Jct. to Merced.</p> <p>Would traverse more undisturbed wilderness area than Pacheco Pass options, but potential noise impacts would be avoided where tunnels are used. Would have fewer potential urban impacts than Pacheco Pass options.</p>	<p>Medium potential impacts—San Jose to Diablo Jct.</p> <p>Low potential impacts—Diablo Jct. to Merced.</p> <p>Would have higher potential impacts on undisturbed wilderness area than other two northern options. Would have fewer potential urban impacts than Pacheco Pass options.</p>	<p>Medium potential impacts—San Jose to Diablo Jct.</p> <p>Low potential impacts—Diablo Jct. to Merced.</p> <p>Would traverse more undisturbed wilderness area than Pacheco Pass options, but potential noise impacts would be avoided where tunnels are used. Would have fewer potential urban impacts than Pacheco Pass options.</p>	<p>Medium potential impacts—San Jose to Gilroy.</p> <p>Low potential impacts—Gilroy to south of Merced.</p> <p>Would have the most potential urban area impacts.</p>	<p>Medium potential impacts—San Jose to Gilroy.</p> <p>Low potential impacts—Gilroy to south of Merced.</p> <p>Would have fewer potential urban area impacts than the Pacheco Pass via Gilroy option.</p>

<sup>16</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	Compatibility: Low because of new corridor. Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low because of new corridor. Also would affect Henry Coe State Park. Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low because of new corridor. Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low overall, but higher compatibility in Gilroy Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts	Compatibility: Low because of new corridor Environmental Justice: Low potential minority population impacts Community: No potential impacts Property: Low potential impacts
<b>Farmlands:</b> <sup>17</sup> Number of ac (ha) potentially affected	Farmland: 549 ac (222 ha)	Farmland: 553 ac (224 ha)	Farmland: 551 ac (223 ha)	Farmland: 756 ac (306 ha)  More potential impacts than Diablo Range Direct options.	Farmland: 770 ac (312 ha)  More potential impacts than Diablo Range Direct options.
<b>Aesthetics and Visual Resources:</b> Number of potential viewing points and descriptions of high contrast/impact areas	Medium potential impacts Viewing points: 0 Natural open space, Orestimba Valley, I-5. High contrast aerial guideway, cut/fill, catenary, tunnel portal  Would have less potential visual impact than at-grade option across Henry Coe State	High potential impacts Viewing points: 0 Natural open space, Henry Coe State Park, Orestimba Valley, I-5. High contrast aerial guideway, cut/fill, catenary, tunnel portal  Would have most potential visual impacts of the Diablo Range direct options.	Medium potential impacts Viewing points: 0 Natural open space, Orestimba Valley, I-5. High contrast aerial guideway, cut/fill, catenary, tunnel portal  Would have less potential visual impact than at-grade option across Henry Coe State Park.	Medium potential impacts 10–20 viewing points Pacheco Creek Valley scenic natural open space. High contrast in line and color.  Pacheco Pass options would potentially impact visual resources less than Diablo Range options since they would parallel the existing linear feature of SR-152 before going in tunnel to cross the natural area of Pacheco Pass.	

<sup>17</sup> The farmland resources study area is defined as 50 ft (15 m) on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
	Park.				
<b>Cultural Resources and Paleontological Resources:</b> <sup>18</sup> Potential presence of historical resources in area of potential effect	7 known cultural resources  Would pass through remote terrain that avoids historical architecture. Northern tunnel option has least known cultural resources of the three Diablo Range options.	21 known cultural resources  Would pass through remote terrain that avoids historical architecture.	22 known cultural resources  Would pass through remote terrain that avoids historical architecture.	13 known cultural resources  Pacheco Pass options have lower sensitivity rankings for archeology, but have high sensitivity ranking for historical architecture through the Santa Clara Valley.	15 known cultural resources  Pacheco Pass options have lower sensitivity rankings for archeology, but have high sensitivity ranking for historical architecture through the Santa Clara Valley.
<b>Hydrology and Water Resources:</b> <sup>19</sup> Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 125 ac (51 ha) Streams: 249,364 linear ft (76,006 linear m) Other water body area: 1 ac (0.40 ha)  Would avoid substantially more floodplains, streams, and other water bodies than Pacheco Pass options. Would potentially impact fewer linear ft of streams than other options.	Floodplains: 180 ac (73 ha) Streams: 296,446 linear ft (90,357 linear m) Other water body area: 3 ac (1.2 ha)  Would avoid substantially more floodplains, streams, and other water bodies than Pacheco Pass options.	Floodplains: 171 ac (69 ha) Streams: 312,359 linear ft (95,207 linear m) Other water body area: 0 ac  Would avoid substantially more floodplains, streams, and other water bodies than Pacheco Pass options.	Floodplains: 589 ac (238 ha) Streams: 451,960 linear ft (137,757 linear m) Other water body area: 60 ac (24 ha)  Would potentially impact substantially more floodplains, streams, and other water bodies than Diablo Direct options. Could exacerbate flooding of Pajaro River watershed.	Floodplains: 482 ac (195 ha) Streams: 436,560 linear ft (133,063 linear m) Other water body area: 107 ac (43 ha)  Would potentially impact substantially more floodplains, streams, and other water bodies than Diablo Direct options. Potentially impacts Pajaro River watershed.

<sup>18</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

<sup>19</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
<b>Biological Resources Including Wetlands:</b> <sup>20</sup> Ac (ha) of wetland and number of special-status species habitat within potential impact study areas	Wetlands: 59 ac (24 ha) Species: 15  Would avoid Henry Coe State Park and potentially impact fewer special-status species than other alignments. High amount of tunneling through Diablo Range would reduce potential fragmentation of wildlife habitat as compared with minimize tunnel option. This option crosses less conservation areas than other Diablo Range Direct options or Pacheco Pass options.	Wetlands: 212 ac (86 ha) Species: 18  Alignment travels through Henry Coe State Park (8.2 mi [13.2 km] total with 2.6 mi [4.2 km] in tunnel). Lowest amount of tunneling through Diablo Range would increase potential fragmentation of wildlife habitat compared to other Diablo Direct options. All three Diablo Range alignments cross private conservation areas.	Wetlands: 212 ac (86 ha) Species: 17  Alignment tunnels under 5.9 mi (9.5 km) of Henry Coe State Park. High amount of tunneling through Diablo Range would reduce potential fragmentation of wildlife habitat compared to minimize tunnel option. All three Diablo Range alignments cross The Nature Conservancy lands, which are considered conservation areas of importance.	Wetlands: 1,059 ac (429 ha) Species: 19  Would potentially impact approximately 100,000 more linear ft (30,480 linear m) of waters and 3,000 ac (1,214 ha) more of special-status habitat than Diablo Direct options. Proximity to SR-152 would result in less fragmentation of undisturbed wildlife habitat than Diablo Range options. Pacheco Pass alignments cross the Romero Ranch conservation area.	Wetlands: 1,094 ac (443 ha) Species: 19  Would potentially impact approximately 100,000 more linear ft (30,480 linear m) of waters and 3,000 ac (1,214 ha) more special-status habitat than Diablo Direct options. Proximity to SR-152 would result in less fragmentation of undisturbed wildlife habitat than Diablo Range options. Pacheco Pass alignments cross the Romero Ranch conservation area.

<sup>20</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

	Diablo Range Direct			Pacheco Pass	
	Northern Tunnel	Minimize Tunnel	Tunnel under Park	Via Gilroy	Via Gilroy Bypass
<b>Section 4(f) and 6(f) Resources:</b> <sup>21</sup> Number of resources rated high potential direct effects	<p>High: 0</p> <p>There are few documented Section 4(f) and 6(f) resources in this area.</p>	<p>High: 1</p> <p>Henry Coe State Park</p> <p>Henry Coe State Park is the second largest state park and a large wilderness area in the Bay Area.</p>	<p>High: 0</p> <p>This alignment passes under Henry Coe State park completely in a tunnel, with very few potential impacts on the park. There could be some potential temporary impacts during construction, but few potential long-term impacts due to use of tunnel boring machines and in-line construction.</p>	<p>High: 0</p> <p>Could potentially impact historical structures through Gilroy including the Gilroy train station.</p>	<p>High: 0</p>
<b>Growth-Induced Potential Impacts:</b> Ac (ha) of urbanized land required	<p>Low potential impacts.</p> <p>These options reduce the statewide total of acres of urbanized land required for the alignment by approximately 600 ac (243 ha) in 2020 and 1,900 ac (769 ha) in 2035, compared to the Pacheco Pass options. Santa Clara, Sacramento, and Stanislaus Counties account for most of this reduction, although even in these cases the reduction is less than 0.5% of total projected urbanized acreage. The reduction in these counties is likely tied to elimination of direct or connecting access in southern Santa Clara, San Benito, and Monterey Counties with this design option. The Diablo Range Direct options are projected to reduce the conversion of mostly prime farmland in Santa Clara County by about 700 ac (283 ha).</p>			<p>Low potential impacts.</p> <p>The stations at Los Banos and Gilroy are forecast to attract a small amount of the urbanized acreage (0.5%) away from traditional urban centers in Santa Clara, Sacramento, and Stanislaus Counties.</p>	

<sup>21</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.



## 6.2.2 Bay Area to Merced Station Options

### D. SAN FRANCISCO AND OAKLAND TO MERCED STATIONS

Station Name (Alignment)	Discussion
<b>Downtown San Francisco</b>	
<b>Transbay Terminal</b> (Caltrain)	<p>The Transbay Terminal would offer greater connectivity to San Francisco and the greater Bay Area than the existing 4th and King site because of its location in the heart of the downtown San Francisco financial district, where many potential HST passengers could walk to the station. In addition, the Transbay Terminal would emerge as the transit hub for all major services to downtown San Francisco, with the advantage of direct connections to BART, Muni, and regional bus transit (Samtrans, AC Transit, and Golden Gate Bridge District). Since the Transbay Terminal would offer greater connectivity to San Francisco and the greater Bay Area than the existing 4th and King site, total travel times to the Transbay Terminal are expected to be superior. The Transbay Terminal is very compatible with existing and planned development and is the focal point of the Transbay redevelopment plan that includes extensive high density residential, office, and commercial/retail development.</p> <p>The Transbay Terminal would have high ridership potential. Intercity ridership forecasts estimate between 7.8 and 17 million total boardings and alightings annually by 2020. However, the rail portion of the connection between 4th and King and the Transbay Terminal (that would be used by Caltrain and HST) requires difficult tunneling throughout the alignment and is estimated to cost nearly \$1.00 billion for the 1.3-mi (2.1-km) extension (including underground HST/Caltrain station, tail tracks, and reconfiguring of the 4th and King yard). Both station options would have low potential environmental impacts.</p> <p>The conceptual operating plan that was assumed for the Business Plan proposed 66 trains (per day per direction - 132 total) to serve the Bay Area. Assuming dedicated use of four tracks and two island platforms by HST, the planned configuration of the Transbay Terminal could serve all of the trains proposed in the Business Plan. However, given the rail facilities planned for the Transbay Terminal (6 tracks and 3 platforms), the overall capacity available to accommodate HST and Caltrain commuter service would need subsequent cooperative operations planning analysis to determine the most efficient mix and scheduling of services to be accommodated. Any HST services (business plan levels or beyond) that are determined not to be accommodated at the Transbay terminal facility could terminate at other stations along the peninsula or East Bay.</p>
<b>4th and King</b> (Caltrain)	<p>The 4th and King station is the existing terminus for the Caltrain commuter rail service. This station site (adjacent to SBC Park) is well connected to the San Francisco Muni system, but stops more than 1 mi (1.6 km) short of the financial district and does not connect to BART or regional bus transit. The station would have about a 2.5-min shorter train travel time to San Francisco than the Transbay Terminal.</p> <p>The 4th and King station would also have high ridership potential. Intercity ridership forecasts (Business Plan low-end forecasts) concluded that the 4th and King terminal station would attract about 100,000 fewer annual intercity passengers than the Transbay Terminal and would also have less potential to serve long-distance commuter passengers. The underground 4th and King terminal station is estimated to cost \$438 million.</p>

Station Name (Alignment)	Discussion
<b>Mid-Peninsula</b>	
<b>Redwood City</b> (Caltrain)	<p>This station would be multi-modal station at the existing Caltrain Redwood City station location. Intercity ridership forecasts estimate between 2.3 and 5.0 million total boardings and alightings annually by 2020.</p> <p>The Redwood City station option would have moderate construction and right-of-way issues and low potential environmental impacts, and is expected to cost about \$10.0 million<sup>22</sup>.</p>
<b>Palo Alto</b> (Caltrain)	<p>This station would be a multi-modal station at the existing Caltrain Palo Alto station location. The Palo Alto station would be a stop for the Caltrain express services, and therefore would have better connectivity to the regional commuter service and to the Peninsula.</p> <p>The Palo Alto station would be expected to have similar costs (\$10.0 million<sup>23</sup>), construction issues, right-of-way issues, and ridership forecasts to the Redwood City station. The Palo Alto station option would be expected to have potential visual quality impacts.</p>
<b>San Jose</b>	
<b>Diridon</b> (Caltrain, Hayward/Niles/Mulford, and I-880)	<p>Diridon station would be a multi-modal hub maximizing connectivity to downtown San Jose and the southern Bay Area. Diridon station would have high connectivity and accessibility and would serve Caltrain, ACE Commuter Rail, Capitol Corridor, Amtrak, VTA buses, and light rail, with a possible link to BART. This station would also have high ridership potential. Intercity ridership forecasts project between 5 and 9.6 million total boardings and alightings annually by 2020.</p> <p>The HST platforms and tracks would be on an aerial structure constructed over the existing Diridon station platforms. As a result, there would be high construction issues but low potential environmental impacts, and a medium level of compatibility with existing land uses. This station is estimated to cost \$93.4 million.</p>
<b>Airports</b>	
<b>SFO-Millbrae</b> (Caltrain)  <b>SJC-Santa Clara</b> (Caltrain and Hayward/Niles/Mulford)  <b>OAK-Oakland Coliseum</b> (Hayward/Niles/Mulford and I-880)	<p>All three potential airport stations would have direct connections to local and regional commuter rail services and would reduce potential travel times and costs for HST passengers who would use the trains for access to the airports. None of the three airport stations would be in the airport terminals, but each would permit easy access by potential people movers or shuttles (at SFO, BART currently provides a direct connection from the Millbrae Caltrain station to the SFO international terminal). All three potential airport stations would be on the alignments being investigated for service to San Francisco and Oakland. The SJC-Santa Clara station is approximately 2.6 miles from San Jose (Diridon) station. Shared-use stations at SFO and Santa Clara are each estimated to cost \$10.0 million.<sup>24</sup> The OAK/Coliseum station is estimated to cost \$27.0 million.</p>

<sup>22</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

<sup>23</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

<sup>24</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated HST lines.

Station Name (Alignment)	Discussion
	<p>SFO is the northern California hub airport for national and international flights. Intercity ridership forecasts project between 1.3 and 2.4 million total boardings and alightings annually by 2020 for the SFO station. The SFO station would be located in a floodplain with high potential floodplain impacts, and it would be at a historical train station with medium potential cultural impacts.</p> <p>The SJC station would have high connectivity, linking to Caltrain, ACE, Capitol Corridor, and VTA buses as well as SJC. It would have low potential environmental impacts, with the exception of a medium ranking for potential cultural impacts since it is at a historical train station.</p> <p>The OAK station would have high connectivity, linking to BART, Capitol Corridor, and AC Transit buses, as well as OAK. It would have a low potential environmental impacts.</p>
<b>Oakland</b>	
<b>West Oakland</b> (Hayward/Niles/Mulford and I-880)	<p>This station would directly connect with BART and would have good freeway access.</p> <p>Both the West Oakland and 12th Street station options would be underground and require alignments with deep-bore tunneling, with associated high construction issues and costs. The West Oakland station is estimated to cost \$336 million. The 5.8-mi (9.3-km) alignment between a common point at 29th Street north of the Oakland Coliseum and West Oakland is estimated to cost \$532 million (not including station, parking, or any associated right-of-way). The West Oakland station site would be adjacent to BART in a mixed-use area. It has a medium ranking for potential land-use compatibility conflicts and presence of minority populations in the vicinity of the station area.</p>
<b>12th Street/City Center</b> (Hayward/Niles/Mulford and I-880)	<p>This station would directly connect with BART and would have good freeway access. The 12th Street station would have superior connectivity, as it is located in the heart of downtown Oakland where many potential HST passengers could walk to the station. The 12th Street City Center BART station is also a transfer station, providing greater connectivity to the regional rail transit system. However, this option has more constructability issues than the Oakland West site.</p> <p>The 12th Street station is estimated to cost \$336 million. The 5.8-mi (9.3-km) (cost) alignment between 29th Street north of the Oakland Coliseum and 12th Street is estimated to cost \$557 million (not including station, parking, or any associated right-of-way). The 12th Street site would be in a deep tunnel under the 12th Street BART station and would have a low ranking for potential land-use compatibility conflicts and presence of minority populations in the vicinity of the station area.</p>
<b>Southern Alameda County</b>	
<b>Union City</b> (Hayward/Niles/Mulford and I-880)	<p>This station location would offer a high level of connectivity. The Union City station would connect to BART, Capitol Corridor, and AC Transit. It would have low construction issues and low potential minority population impacts, and is estimated to cost \$28.7 million.</p>
<b>Auto Mall Parkway</b> (Hayward/Niles/Mulford)	<p>Auto Mall Parkway station would have good access to the I-880 freeway and connect to the Capitol Corridor, ACE Commuter Rail, and AC Transit. This site would only be served by the Hayward/Niles/Mulford alignment option. The Auto Mall Parkway station would have similar potential impacts and costs as the Union City station option, except that it would have medium potential impacts on parks and wildlife since it is located adjacent to the Don Edwards Wildlife Refuge. The Auto Mall Parkway station is estimated to cost \$28.7 million.</p>

Station Name (Alignment)	Discussion
<b>Southern Santa Clara County</b>	
<b>Gilroy</b> (Pacheco Pass via Gilroy)	<p>Southern Santa Clara County would be served by a station at either Gilroy or Morgan Hill. Both of these potential stations would be at Caltrain commuter rail station locations. The Gilroy station is about 10 mi (16 km) south of Morgan Hill and therefore provides better connectivity and travel times and less access costs to the Santa Cruz, Monterey/Carmel, and Salinas markets. The Gilroy station is only served by the Pacheco Pass/Gilroy/Caltrain alignment; neither the Gilroy nor the Morgan Hill station sites would be served by the Diablo Range Direct alignment options.</p> <p>The Gilroy and Morgan Hill station options would have similar costs, construction issues, and operational issues, all of which were ranked as medium potential impacts. Both station options would be expected to have low potential environmental impacts; however, the Gilroy station site is located in a 100-yr floodplain and would have high potential floodplain impacts. Intercity ridership forecasts estimated the Gilroy station to have between 1.5 and 2.3 million annual total boardings and alightings by 2020. The Gilroy aerial station option is estimated to cost \$75.6 million<sup>25</sup>.</p>
<b>Morgan Hill</b> (Pacheco Pass via Gilroy Bypass)	<p>Southern Santa Clara County would be potentially served by a station at Morgan Hill. This station would be at a Caltrain commuter rail station location. The Morgan Hill station site would be served by the Diablo Range Direct alignment options. This site is expected to have about the same intercity ridership potential as the Gilroy site and is estimated to cost \$166 million.</p>
<b>Western Merced County</b>	
<b>Los Banos</b> (Pacheco Pass)	<p>The potential Los Banos station would be north of Los Banos. It would have good accessibility to I-5 and would greatly reduce travel times and access costs to that population compared to the Gilroy or Morgan Hill sites.</p> <p>The Los Banos station would have low ridership and revenue potential, and limited connectivity and accessibility. In 2020, this station is forecast to serve a population of about 88,000 and to have between 155,000 and 190,000 annual total boardings and alightings. The Los Banos station site is located in a 100-yr floodplain and would have high potential floodplain impacts. This site would have medium potential impacts on water resources with potential impacts on the San Luis Waterway, and high potential impacts on threatened and endangered species. The station would have low construction, right-of-way, land use, and visual quality issues, and is assumed to cost about \$28.7 million.</p>

<sup>25</sup> Costs are reduced because of lower proposed speed for station stopping tracks, which would require less infrastructure and right-of-way.

### 6.3 SACRAMENTO TO BAKERSFIELD REGION

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

#### 6.3.1 Sacramento to Bakersfield Alignment Options

##### A. SACRAMENTO TO STOCKTON ALIGNMENT OPTIONS

All information presented is for the area from Sacramento to Stockton. This segment is shown in Figure 6.3-1.

Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)		Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)
Physical/Operational Characteristics		
<b>Alignment Description</b>	The UPRR alignment begins at the Sacramento Rail Depot in downtown Sacramento. North of Lodi, the alignment diverges from UPRR to the CCT to bypass Lodi and reconnects to the UPRR to serve the proposed downtown Stockton station site. This alignment option includes a new alignment bypass of Stockton for express services. Station options considered in this segment include Sacramento Downtown station, Power Inn Road station and Stockton ACE Downtown.	The CCT alignment begins at the Sacramento Rail Depot in downtown Sacramento, using the UPRR alignment until transitioning to CCT near the potential Power Inn Road station site. The CCT alignment reconnects to UPRR to serve the proposed downtown Stockton station site. This alignment option includes a new alignment bypass of Stockton for express services. Station options considered in this segment include Sacramento Downtown station Power Inn Road station and Stockton ACE Downtown.
<b>Length in miles (km)</b>	49 mi (79 km)	50 mi (80 km)
<b>Cost<sup>26</sup> (dollars)</b>	\$2.49 billion	\$2.64 billion
<b>Travel Time (min)</b>	20 min	21 min
<b>Ridership</b>	The UPRR is a more direct route with slightly shorter travel times (1 min less). The UPRR and CCT rail alignments would serve the same basic populations and the same number of potential stations.	The CCT and UPRR rail alignments would serve the same basic populations and the same number of potential stations.
<b>Constructability</b>	The UPRR traverses more urban area than the CCT; however, HST would share freight right-of-way through Sacramento.	The transition from CCT at the Power Inn Road potential station site to the UPRR alignment to reach downtown Sacramento would include 2 mi (3 km) of property acquisition takes in urban Sacramento.

<sup>26</sup> Segment cost and length includes 3.8 mi south of Stockton ACE Downtown station (Little John Creek).

Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)		Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)
Potential Environmental Impacts		
<b>Travel Conditions</b>	The UPRR would result in slightly shorter travel times.	The CCT would result in slightly longer travel times.
<b>Noise and Vibration:</b> <sup>27</sup> High, medium, and low potential impacts	<p>Low potential impacts in overall segment High potential impacts in urban areas</p> <p>The UPRR alignment rates low overall because of the sparse residential development along most of the alignment. High potential impacts result through Sacramento; however, speeds are restricted below 100 mph (161 kph) through the urban core as a result of speed-restricting curves. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.</p>	<p>Low potential impacts in overall segment High potential impacts in urban areas</p> <p>The CCT alignment would have fewer potential noise impacts than the UPRR because there are fewer residential areas near the alignment. However, the CCT is a recently abandoned freight corridor, so there is less ambient noise in this corridor than in the UPRR.</p>

<sup>27</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	<b>Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)</b>	<b>Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)</b>
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatibility: High potential impacts</p> <p>Environmental Justice: Low potential minority population impacts</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>Although compatibility is considered low, the proposed alignment would be on or adjacent to the existing rail corridor. All station sites are located in areas where minority populations have been identified. Although stations would create potential impacts, they would also produce community access benefits. The Sacramento Valley and Stockton Downtown stations sites are at existing rail hub stations.</p>	<p>Compatibility: High potential impacts</p> <p>Environmental Justice: Low potential minority population impacts</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>The CCT has slightly more land designated for residential and agricultural use than the UPRR route, which would make it potentially less compatible with future land uses. The CCT alignment traverses primarily rural lands, resulting in low potential property impacts. However, there are some small segments with high potential impacts, particularly in Sacramento if the downtown station (UPRR connection) is selected.</p>
<b>Farmlands:</b> <sup>28</sup> Ac (ha) of farmland (depending on specific configuration with loops and connections)	<p>Farmlands: 588–599 ac (238–242 ha)</p> <p>Existing UPRR rail alignment reduces potential impacts on farmlands between Sacramento and Lodi. Connection to CCT north of Lodi and express loop to the east of Stockton would require new alignments through farmlands, which could have potential severance impacts.</p>	<p>Farmlands: 449–460 ac (182–186 ha)</p> <p>Existing UP Existing CCT rail alignment reduces potential impacts on farmlands between Sacramento and Stockton. The express loop to the east of Stockton would require new alignments through farmlands, which could have potential severance impacts.</p>
<b>Cultural Resources and Paleontological Resources:</b> <sup>29</sup> Potential presence of historical resources in area of potential effect	<p>Known cultural resources: 39–49</p> <p>Potential for historical resources through downtown Sacramento and Stockton. However, the alignments through both cities would use existing rail right-of-way.</p>	<p>Known cultural resources: 44–54</p> <p>Potential for historical resources through downtown Sacramento and Stockton. However, through both cities, the alignments would use existing rail right-of-way. The CCT traverses fewer urban areas.</p>

<sup>28</sup> The farmland resources study area is defined as 50 ft (15 m) on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

<sup>29</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

	<b>Union Pacific Railroad (UPRR) (Downtown Sacramento to Downtown Stockton)</b>	<b>Central California Traction (CCT) (Downtown Sacramento to Downtown Stockton)</b>
<b>Hydrology and Water Resources:</b> <sup>30</sup> Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 371 total ac (150 ha) for option with express loop connection to UPRR; 610 total ac (247 ha) for option with express loop connection to Burlington Northern Santa Fe (BNSF) Stream crossings: 57,843 linear ft (17,631 linear m) Lake ac: 0.94 ac (0.38 ha)  Use of existing rail alignments reduces potential hydrology impacts.	Floodplains: 459 total ac (186 ha) for option with express loop connection to UPRR; 644 total ac (261 ha) for option with express loop connection to BNSF Stream crossings: 52,267 linear ft (15,931 linear m) Lake ac: 0 ac  Use of existing rail alignments reduces potential hydrology impacts.
<b>Biological Resources Including Wetlands:</b> <sup>31</sup> Ac (ha) of wetland and number of special-status species habitat within potential impact study areas	Wetlands: 1,175–1,185 ac (476–480 ha) Species: 243 sensitive species and habitat occurrences  The UPRR alignment would have higher potential to disturb wetlands and to encounter threatened and endangered species. Although a new corridor would be required for Stockton express service, most of the alignment is within or adjacent to existing rail right-of-way.	Wetlands: 869–874 ac (352–354 ha) Species: 31 sensitive species and habitat occurrences  The CCT alignment would have less potential disturbances to biological resources than the UPRR alignment.
<b>Section 4(f) and 6(f) Resources:</b> <sup>32</sup> Ac (ha) of parkland near HST right-of-way	Resources rated high: 7  Alignment potentially impacts River Park, Sacramento; Tahoe Tallac Park, Sacramento; Cottonwood Park, Sacramento County; Illa Collin Park, Sacramento County; Tillotson Parkway, Sacramento County; Mendoza Park, Elk Grove; Panella Park, Stockton.	

<sup>30</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>31</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline. Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

<sup>32</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.



## B. STOCKTON TO MERCED ALIGNMENT OPTIONS

All information presented is for the area from Stockton to Merced. This segment is shown in Figures 6.3-2a and 6.3-2b.

UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)		Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)
Physical/Operational Characteristics		
<b>Alignment Description</b>	UPRR rail alignment from Stockton to Merced. This option includes a new alignment around the Modesto urban area for express services, which is required as a result of speed-restricting curves through Modesto. Station options considered in this segment include Modesto downtown and Merced downtown.	Both the UPRR and CCT alignments (and express loops) converge with BNSF southeast of Stockton. Just north of Merced, a new alignment is needed to transition from BNSF to UPRR through Merced. Station options considered in this segment include Amtrak Briggsmore and Merced downtown.
<b>Length in miles (km)</b>	67.5 mi (108.6 km)	67.3 mi (108.3 km)
<b>Cost (dollars)</b>	\$2.45 billion <sup>33</sup>	\$2.05 billion <sup>34</sup>
<b>Travel Time (min)</b>	25 min	24 min
<b>Constructability</b>	Considerable construction issues associated with urban construction, including aerial structures through downtown Modesto and Turlock.	Fewest potential construction impacts with minimal urban area traversed.

<sup>33</sup> Segment cost and length ends 2.5 mi (4.0 km) southeast of Merced Downtown station (East Gerard Avenue).

<sup>34</sup> Segment cost and length begins 3.8 mi (6.1 km) south of Stockton ACE downtown station (Little Johns Creek).

UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)		Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)
Potential Environmental Impacts		
<b>Travel Conditions</b>	The UPRR and BNSF rail alignments would serve the same basic populations and same number of potential stations. However, the UPRR alignment serves the potential downtown Modesto station site, whereas the BNSF serves the Modesto Briggsmore station site.	The BNSF and UPRR rail alignments would serve the same basic populations and same number of potential stations. The Merced Castle Air Force Base (AFB) station site is served by the BNSF alignment.
<b>Noise and Vibration:</b> <sup>35</sup> High, medium, and low potential impacts	<p>Low potential impacts in overall segment High potential impacts in urban areas</p> <p>The UPRR alignment would have higher potential noise impacts than the BNSF alignment. The UPRR goes through more urban/developed area as it passes through the cities and communities that developed along the rail line. Express services would travel at high speeds through these communities (220 mph [354 kph]). Conceptually, the UPRR alignment would have a substantial amount of aerial structure through Manteca, Modesto, Keyes, Turlock, and Atwater, which would exacerbate potential noise impacts (potential impacts would be rated high through these communities).</p>	<p>Low potential impacts</p> <p>The BNSF avoids most of the urban development between Stockton and Merced, and the alignment would be at grade through the outskirts of Modesto (Briggsmore), and through Hughson, Denair, Winton, and Atwater. Express services would travel at high speeds through these communities (220 mph [354 kph]). There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.</p>
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatibility: Medium</p> <p>Environmental Justice: Low potential minority population impacts</p> <p>Community: Low potential impacts</p> <p>Property: Medium potential impacts</p> <p>The UPRR would have more potential property impacts since it traverses more urban land and would have more construction issues with aerial structures through downtown areas.</p>	<p>Compatibility: Medium</p> <p>Environmental Justice: Low potential minority population impacts</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>The BNSF alignment traverses primarily rural lands resulting in a low potential property impact and low potential minority population impacts.</p>

<sup>35</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)	Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)
<b>Farmlands:</b> <sup>36</sup> Ac (ha) of farmland (depending on specific configuration with loops and connections)	Farmlands: 397 ac (161 ha)  The UPRR may have potential severance impacts as a result of the new alignment around Modesto, which would potentially impact about 97 ac (39 ha) of farmlands.	Farmlands: 512 ac (207 ha)  The BNSF alignment follows the existing rail right-of-way and may have potential severance impacts. However, this alignment traverses more agricultural land than the UPRR alignment.
<b>Cultural Resources and Paleontological Resources:</b> <sup>37</sup> Potential presence of historical resources in area of potential effect	Known cultural resources: 120–126  The potential for cultural resources and historical structures is greater along the UPRR alignment. Cultural resources are particularly concentrated on this line between Keyes and Atwater.	Known cultural resources: 47–53  The BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.
<b>Hydrology and Water Resources:</b> <sup>38</sup> Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 147–169 total ac (59–68 ha) Stream crossings: 22,415–24,167 linear ft (6,832–7,366 linear m) Lake ac: 0 ac  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 340 total ac (138 ha) Stream crossings: 26,503 linear ft (8,078 linear m) Lake ac: 0 ac  Use of existing rail alignments reduces potential hydrology impacts.

<sup>36</sup> The farmland resources study area is defined as 50 ft on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

<sup>37</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

<sup>38</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	UPRR with Modesto Express Loop (Downtown Stockton to Downtown Merced)	Burlington Northern Santa Fe (Downtown Stockton to Downtown Merced)
<b>Biological Resources Including Wetlands:</b> <sup>39</sup> Ac (ha) of wetland and number of special-status species habitat within potential impact study areas	<p>Wetlands: 131–184 ac (53–74 ha)</p> <p>Species: 23 sensitive species and habitat occurrences</p> <p>There is no notable difference between the two alignment options for biological resources, and there are low potential impacts on vegetation communities along these alignments (land is either urban or agricultural uses). All of the threatened and endangered species along the UPRR alignment are vernal pool species.</p>	<p>Wetlands: 151–157 ac (61–64 ha)</p> <p>Species: 8–11 sensitive species and habitat occurrences</p> <p>There is no notable difference between the two alignment options for biological resources, and there are low potential impacts on vegetation communities along these alignments (land is either urban or agricultural uses).</p>
<b>Section 4(f) and 6(f) Resources:</b> <sup>40</sup> Ac (ha) of parkland near HST right-of-way	<p>Resources rated high: 5</p> <p>Alignment potentially impacts Salida County Park, Tuolumne River Regional Park, Stanislaus County Fairgrounds, Broadway Park, and Central Park in Turlock.</p>	<p>Resources rated high: 3</p> <p>Alignment potentially impacts Jacob Meyer Regional Park, San Joaquin County; Zerillo Park, Riverbank; Mainstreet Park, Escalon.</p>

<sup>39</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline. Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

<sup>40</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

## C. MERCED TO FRESNO ALIGNMENT OPTIONS

All information presented is for the area from Merced to Fresno. This segment is shown in Figures 6.3-3a and 6.3-3b.

Union Pacific Railroad (Downtown Merced to Downtown Fresno)		Burlington Northern Santa Fe (Downtown Merced to Downtown Fresno)
Physical/Operational Characteristics		
<b>Alignment Description</b>	UPRR rail alignment from Merced to Fresno. Station options considered in this segment include Fresno downtown station.	A new alignment would be needed to transition from UPRR to BNSF south of Merced. Just north of Fresno, a new alignment is needed to transition from BNSF to UPRR through Fresno. Station options considered in this segment include Fresno downtown station.
<b>Length in miles (km)</b>	55 mi (89 km)	57 mi (92 km)
<b>Cost (dollars)</b>	\$1.86 billion <sup>41</sup>	\$1.45 billion <sup>42</sup>
<b>Travel Time (min)</b>	20 min	21 min
<b>Constructability</b>	Considerable construction issues associated with urban construction, including aerial structures through downtown Madera.	Fewest potential construction impacts with minimal urban area traversed.
Potential Environmental Impacts		
<b>Travel Conditions</b>	The UPRR and BNSF rail alignments would serve the same basic populations and same number of potential stations.	The BNSF and UPRR rail alignments would serve the same basic populations and same number of potential stations.

<sup>41</sup> Segment cost and length begins about 2.5 mi (4.0 km) southeast of Merced downtown station (East Gerard Avenue).

<sup>42</sup> Segment cost and length end about 2.5 mi (4.0 km) southeast of Fresno downtown station (East Jensen Avenue).

	<b>Union Pacific Railroad (Downtown Merced to Downtown Fresno)</b>	<b>Burlington Northern Santa Fe (Downtown Merced to Downtown Fresno)</b>
<b>Noise and Vibration:</b> <sup>43</sup> High, medium, and low potential impacts	<p>Low potential impacts in overall segment. High potential impacts in urban areas.</p> <p>The UPRR alignment would have higher potential noise impacts than the BNSF alignment. The UPRR goes through more urban/developed area as it passes through the towns and communities that developed along the rail line. Express services would travel at high speeds through these communities (220 mph [354 km]). Conceptually, the UPRR alignment would have a substantial amount of aerial structure through Chowchilla and Madera, which would exacerbate potential noise impacts. Potential noise impacts would be high through Madera.</p>	<p>Low potential impacts.</p> <p>The BNSF avoids most of the urban development between Merced and Fresno, and the alignment would be at grade through Le Grand and the outskirts of Madera. Express services would travel at high speeds through these communities (220 mph [354 km]). There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at existing grade crossings.</p>
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatibility: Medium Environmental Justice: Minority populations present at points along alignment option Community: Low potential impacts Property: Low potential impacts</p> <p>The UPRR would have more potential property impacts since it traverses more urban land and would have more construction issues with aerial structures through downtown areas.</p>	<p>Compatibility: Medium Environmental Justice: Minority populations present at points along alignment option Community: Low potential impacts Property: Low potential impacts</p> <p>The BNSF alignment traverses primarily rural lands resulting in a low potential property impact.</p>
<b>Farmlands:</b> <sup>44</sup> Ac (ha) of farmland (depending on specific configuration with loops and connections)	<p>Farmlands: 295–399 ac (119–161 ha)</p> <p>Potential severance impacts using existing rail alignment between Merced and Fresno.</p>	<p>Farmlands: 497–601 ac (201–243 ha)</p> <p>Potential severance impacts for new alignment transitions between UPRR and BNSF south of Merced and north of Fresno.</p>

<sup>43</sup> Generally, 'vibration' is not a significant impact. However, sensitive and specific areas such as historic structures, special habitats, etc. may be affected.

<sup>44</sup> The farmland resources study area is defined as 50 ft on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

	Union Pacific Railroad (Downtown Merced to Downtown Fresno)	Burlington Northern Santa Fe (Downtown Merced to Downtown Fresno)
<b>Cultural Resources and Paleontological Resources:</b> <sup>45</sup> Potential presence of historical resources in area of potential effect	Known cultural resources: 11–16  Potential impacts to cultural resources and historical structures are somewhat greater along the UPRR alignment than the BNSF alignment.	Known cultural resources: 5–10  The BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.
<b>Hydrology and Water Resources:</b> <sup>46</sup> Potential impacts and associated ac (ha) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 336–338 total ac (136–137 ha) Stream crossings: 6,140–8,554 linear ft (1,871–2,607 linear m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 321–326 total ac (130–132 ha) Stream crossings: 10,129–17,646 linear ft (3,087–5,379 linear m) Lake ac: 0 ac (0 ha)  New alignment transitions (to/from UPRR) and greater number of stream crossings result in slightly higher potential impacts for BNSF.
<b>Biological Resources Including Wetlands:</b> <sup>47</sup> Ac (ha) of wetland and number of special-status species habitat within potential impact study areas	Wetlands: 237–247 ac (96–100 ha) Species: 28–30 sensitive species and habitat occurrences  The UPRR would encounter considerable fewer potential wetlands than the BNSF option. Both UPRR and BNSF would have relatively few potential impacts on sensitive vegetation communities.	Wetlands: 1,419–1,429 ac (574–578 ha) Species: 28–30 sensitive species and habitat occurrences  The BNSF alignment traverses annual grasslands and has relatively extensive potential wetland interface (more than 1,400 ac [567 ha]).

<sup>45</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

<sup>46</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>47</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline. Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

## D. FRESNO TO BAKERSFIELD ALIGNMENT OPTIONS

All information presented is for the area from Fresno to Bakersfield. This segment is shown in Figures 6.3-4a and 6.3-4b.

Union Pacific Railroad				Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Physical/Operational Characteristics</b>						
<b>Alignment Description<sup>48</sup></b>	UPRR rail alignment from Fresno to Bakersfield (Golden State station). Station options considered in this segment include Visalia Airport and Bakersfield Golden State.	UPRR rail alignment from Fresno to Bakersfield (Truxton station) with a transition north of Bakersfield to BNSF. Station options considered in this segment include Visalia Airport and Truxton (BNSF).	UPRR rail alignment from Fresno to Bakersfield using a new alignment bypass around the Tulare urban area. Station options considered in this segment include Visalia Airport and Bakersfield Golden State.	UPRR rail alignment from Fresno to Bakersfield (Truxton station) with a loop line in Bakersfield to serve the Truxton site. Station options considered in this segment include Visalia Airport and Truxton (BNSF).	BNSF rail alignment from Fresno to Bakersfield (Truxton station). Station options considered in this segment include Truxton (BNSF).	BNSF rail alignment from Fresno to Bakersfield (Golden State station) with a transition north of Bakersfield to the UPRR. Station options considered in this segment include Bakersfield Golden State.
<b>Length in mi (km)</b>	106 mi (171 km)	111 mi (179 km)	106 mi (171 km)	108 mi (174 km)	111 mi (179 km)	109 mi (175 km)
<b>Cost<sup>49</sup> (dollars)</b>	\$2.55 billion	\$3.09 billion	\$2.54 billion	\$2.99 billion	\$2.71 billion	\$2.26 billion
<b>Travel Time (min)</b>	35 min	37 min	35 min	35 min	36 min	36 min

<sup>48</sup> Golden State option ends about 2.5 mi (4.0 km) southeast of Golden State station (at Beale Avenue). Truxton option ends at Truxton station (at Union Avenue).

<sup>49</sup> Segment cost and length begins about 2.5 mi (4.0 km) southeast of Fresno downtown Station (East Jensen Avenue).



	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Constructability</b>	Considerable construction issues associated with urban construction, including aerial structures through downtown Selma, Traver, Goshen, Tulare, Pixley, and Delano. However, fewest potential construction impacts through Bakersfield (mostly at grade).	Same construction issues as the downtown Fresno to Golden State station option, with additional potential impacts using BNSF through Bakersfield. More aerial structure through Bakersfield would have considerable construction issues.	Same construction issues as the downtown Fresno to Golden State station option, except the alignment avoids Tulare urban area.	Same construction issues as the downtown Fresno to Golden State station option, with additional potential impacts from Truxton loop through Bakersfield. More aerial structure through Bakersfield would have considerable construction issues.	Fewer potential construction impacts with minimal urban area traversed as compared to UPRR north of Bakersfield. More difficult construction and aerial structure through Bakersfield than UPRR.	Fewer potential construction impacts with minimal urban area traversed. Fewest potential impacts through Bakersfield.
<b>Potential Environmental Impacts</b>						
<b>Travel Conditions</b>	This alignment option would serve potential stations at Visalia Airport and Bakersfield Golden State station or Bakersfield Airport station sites.	This alignment option would serve potential stations at Visalia Airport and Bakersfield Truxton station. The Truxton station would have the highest connectivity and accessibility for Bakersfield.	This alignment option would serve potential stations at Visalia Airport and Bakersfield Golden State station or Bakersfield Airport station sites.	This alignment option would serve potential stations at Visalia Airport and Bakersfield Truxton station. The Truxton station would have the highest connectivity and accessibility for Bakersfield.	This alignment option would serve potential stations at Hanford and Bakersfield Truxton station. Truxton station would have the highest connectivity and accessibility for Bakersfield.	This alignment option would serve potential stations at Hanford and Bakersfield Golden State station or Bakersfield Airport station sites.

	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Noise and Vibration:</b> <sup>50</sup> High, medium, and low potential impacts	<p>Low potential impacts in overall segment.</p> <p>High potential impacts in urban areas.</p> <p>Although a majority of the alignment would have low potential impacts, the UPRR would have high potential noise impacts in urban areas where the alignment is predominately on aerial structure (Selma, Traver, Goshen, Tulare, Pixley, and Delano). Express services travel at high speeds through these communities (220 mph [354 km]). However, UPRR would have fewer potential noise impacts than BNSF through Bakersfield.</p>	<p>Low potential impacts in overall segment.</p> <p>High potential impacts in urban areas.</p> <p>High potential for noise in urban areas. Higher potential impacts in Bakersfield using BNSF.</p>	<p>Low potential impacts in overall segment.</p> <p>High potential impacts in urban areas.</p> <p>Potential noise impacts for Tulare area would be reduced by an estimated 12–16% compared to other alignments.</p>	<p>Low potential impacts in overall segment.</p> <p>High potential impacts in urban areas.</p> <p>Potential noise impacts would increase with two alignments through Bakersfield.</p>	<p>Low potential impacts in overall segment.</p> <p>High potential impacts in urban areas.</p> <p>BNSF alignments have less potential noise impacts than UPRR because they are outside urban areas. BNSF is assumed to need substantial aerial structure through Hanford and Shafter. Express services would travel at high speeds through Shafter (220 mph [354 km]), resulting in high potential impacts. BNSF would have more potential noise impacts than UPRR through Bakersfield (mostly aerial).</p>	<p>Low potential impacts in overall segment.</p> <p>Fewer potential noise impacts. Fewer potential impacts through Bakersfield by using UPRR alignment. This alignment avoids potential impacts on the Town of Shafter.</p>

<sup>50</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatibility: Medium-low</p> <p>Environmental Justice: Minority populations present at points along the alignment option</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>North of Bakersfield, UPRR would have more potential property impacts than BNSF since it traverses more urban land and would have more construction issues with aerial structures through downtown areas. However, UPRR would have less potential impact through Bakersfield and outlying metropolitan area.</p>	<p>Compatibility: Medium-low</p> <p>Environmental Justice: Minority populations present at points along the alignment option</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>More potential impacts than UPRR alignment through Bakersfield. Potential severance impacts with transition to BNSF.</p>	<p>Compatibility: Medium-low</p> <p>Environmental Justice: Minority populations present at points along the alignment option</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>Tulare bypass loop would decrease potential property impacts and potential community impacts through Tulare, but new alignment through agricultural lands would not be compatible with existing and future plans.</p>	<p>Compatibility: Medium-low</p> <p>Environmental Justice: Low potential minority population impacts</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>This option would have similar potential impacts to UPRR downtown Fresno to Golden State station option.</p>	<p>Compatibility: Medium</p> <p>Environmental Justice: Minority populations present at points along the alignment option</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>North of Bakersfield, BNSF would have fewer potential property impacts than UPRR since it traverses more urban land and would have more construction issues with aerial structures through downtown areas. However, BNSF has more potential impacts through Bakersfield and outlying metropolitan area.</p>	<p>Compatibility: Medium</p> <p>Environmental Justice: Minority populations present at points along the alignment option</p> <p>Community: Low potential impacts</p> <p>Property: Low potential impacts</p> <p>Fewer potential impacts than BNSF through Bakersfield. Potential severance impacts with transition to UPRR.</p>

	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Farmlands.</b> <sup>51</sup> Ac (ha) potentially affected	Farmland: 706 ac (286 ha)  UPRR rail alignment may have potential impacts on farmlands.	Farmland: 726 ac (294 ha)  Transition to BNSF adds 20 ac (8 ha) of potentially impacted farmland and may have potential severance impacts.	Farmland: 752 ac (304 ha)  Bypass of Tulare adds 46 ac (19 ha) of potentially impacted farmland, and would have 119 ac (48 ha) with potential severance impacts.	Farmland: 706 ac (286 ha)  UPRR rail alignment would have fewer potential impacts on farmlands.	Farmland: 1,060 ac (429 ha)  BNSF would potentially impact more farmlands than UPRR.	Farmland: 1,093 ac (442 ha)  BNSF would potentially impact more farmlands than UPRR. Transition to UPRR would add 33 ac (13 ha) of potentially impacted farmland and may have potential severance impacts.
<b>Cultural Resources and Paleontological Resources.</b> <sup>52</sup> Potential presence of historical resources in area of potential effect	Known cultural resources: 51–52  Potential impacts to cultural resources and historical structures are greater along the UPRR alignment.	Known cultural resources: 52–53  Potential impacts to cultural resources and historical structures are greater along the UPRR alignment.	Known cultural resources: 41–42  Potential impacts to cultural resources and historical structures are greater along the UPRR alignment. Avoids cultural and historic resources through Tulare.	Known cultural resources: 59–60  Potential impacts to cultural resources and historical structures are greater along the UPRR alignment. Additional potential impacts through Bakersfield for Truxton loop.	Known cultural resources: 19–20  BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.	Known cultural resources: 17–18  The BNSF traverses less urban area and has fewer potential impacts on sensitive cultural resources and historical structures than the UPRR alignment.

<sup>51</sup> The farmland resources study area is defined as 50 ft on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

<sup>52</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Hydrology and Water Resources:</b> <sup>53</sup> Potential impacts and associated linear feet (linear m) of floodplains and linear ft (m) of streams within potential impact study areas	Floodplains: 113,221–113,992 linear ft (34,510–34,745 linear m) Stream crossings: 23,042 linear ft (7,023 linear m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 119,389–120,144 linear ft (36,390–36,620 linear m) Stream crossings: 25,882 linear ft (7,889 linear m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 114,763–115,531 linear ft (34,980–35,214 linear m) Stream crossings: 19,972 linear ft (6,087 linear m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 122,457–123,225 linear ft (37,325–37,559 linear m) Stream crossings: 26,473 linear ft (8,069 m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 97,244–97,998 linear ft (29,640–29,870 linear m) Stream crossings: 38,215 linear ft (11,648 m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.	Floodplains: 88,008–89,435 linear ft (26,824–27,260 linear m) Stream crossings: 40,006 linear ft (12,194 m) Lake ac: 0 ac (0 ha)  Use of existing rail alignment reduces potential hydrology impacts.

<sup>53</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Biological Resources Including Wetlands:</b> <sup>54</sup> Ac (ha) of wetland and number of special-status species habitat within potential impact study areas	<p>Wetlands: 546 ac (221 ha)</p> <p>Species: 42–47 sensitive species and habitat occurrences</p> <p>UPRR alignments would have fewer potential wetland impacts than BNSF.</p>	<p>Wetlands: 641 ac (259 ha)</p> <p>Species: 8–13 sensitive species and habitat occurrences</p> <p>UPRR alignments would have fewer potential wetland impacts than BNSF. The new alignment transition to BNSF would increase potential wetlands and severance impacts (95 ac [38 ha] more).</p>	<p>Wetlands: 549 ac (222 ha)</p> <p>Species: 42–47 sensitive species and habitat occurrences</p> <p>UPRR alignments would have fewer potential wetland impacts than BNSF.</p>	<p>Wetlands: 581 ac (235 ha)</p> <p>Species: 42–47 sensitive species and habitat occurrences</p> <p>UPRR alignments would have fewer potential wetland impacts than BNSF. The additional loop to serve the Truxton station site would increase the wetlands potentially impacted (35–37 ac [14–15 ha] more).</p>	<p>Wetlands: 2,099 ac (849 ha)</p> <p>Species: 26–31 sensitive species and habitat occurrences</p> <p>BNSF has more wetlands potentially impacted. These options have nearly 4.85 mi (7.81 km) of alignment of encroachment on vernal pool formation.</p>	<p>Wetlands: 2,068 ac (837 ha)</p> <p>Species: 59–64 sensitive species and habitat occurrences</p> <p>BNSF has more wetlands potentially impacted. These options have nearly 4.85 mi (7.81 km) of alignment of encroachment on vernal pool formation.</p>

<sup>54</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline. Databases and other sources were searched for indications of potential habitat that was considered to signify the possible presence of special-status species, but neither the presence of such species nor the presence of actual habitat was confirmed by review in the field.

	Union Pacific Railroad			Burlington Northern Santa Fe		
	Downtown Fresno to Golden State Station	Downtown Fresno to Truxton Station (Bakersfield connector to BNSF)	Downtown Fresno to Golden State Station (new alignment around Tulare)	Downtown Fresno to Truxton Station (downtown Truxton Station loop)	Downtown Fresno to Truxton Station	Downtown Fresno to Golden State Station (Bakersfield connector to UPRR)
<b>Section 4(f) and 6(f) Resources:</b> <sup>55</sup> Ac (ha) of parkland near HST right-of-way	Resources rated high: 4  Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 4  Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 4  Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 4  Alignment potentially impacts W.H. Shafer Park, Selma; Centennial Park, Tulare; Metropolitan Recreational Center, Bakersfield; Wells Park, Bakersfield.	Resources rated high: 2  Alignment potentially impacts Colonel Allensworth State Historical Park, Tulare County; Pixley National Wildlife Refuge, Tulare County.	Resources rated high: 2  Alignment potentially impacts Colonel Allensworth State Historical Park, Tulare County; Pixley National Wildlife Refuge, Tulare County.

<sup>55</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

### 6.3.2 Sacramento to Bakersfield Station Options

The station options for this region are shown in Figures 6.3-5a and 6.3-5b.

Station Name (Alignment)	Discussion
<b>Downtown Sacramento</b>	
<b>Downtown Sacramento</b> (UPRR and CCT/BNSF)	<p>The Sacramento downtown station has better connectivity in Sacramento than the Power Inn Road station location. The downtown station site is located in downtown Sacramento and is within walking distance of the State Capitol. This multimodal station location serves the existing Amtrak services to Sacramento, including the Capitol Corridor, and the Sacramento LRT is being extended to directly link to this station site. This site also has good access to I-5. Since the downtown station would offer greater connectivity to downtown Sacramento and the Sacramento region, total travel times to the downtown station are expected to be better than to the Power Inn station. The downtown station would have high ridership potential. Intercity ridership forecasts estimate between 7.2 and 12.2 million total boardings and alightings annually by 2020.</p> <p>The Sacramento downtown station is estimated to cost \$224 million. The alignment between Power Inn Road and the downtown station would be on 4.27 mi (6.87 km) of aerial structure with considerable potential construction impacts. The downtown station HST station platforms would be constructed on an aerial structure (above the platforms for existing rail services).</p> <p>The Sacramento downtown station would have low potential impacts on biological resources and hydrology, and fewer visual quality potential impacts than the Power Inn Road station option. This site would potentially impact 6.6 ac (2.7 ha) of parkland and would have high potential cultural resource impacts. There is a majority of ethnic minority and low income population near the station area.</p>
<b>Power Inn Road</b> (UPRR and CCT/BNSF)	<p>The Power Inn Road station site has good intermodal access to the Sacramento LRT and US-50. The Power Inn station would have about a 3-min shorter line-haul travel time to Sacramento than the downtown Sacramento station, since the trains would travel at relatively slow speeds between Power Inn and the downtown site (about a 7.5-mi [12-km] distance). However, it is located outside of downtown Sacramento, more than 5 mi (8 km) from the State Capitol. The Power Inn station would have less ridership potential than the downtown station and is rated as having low connectivity and accessibility.</p> <p>The Power Inn station is estimated to cost \$224 million. The shorter alignment associated with this station option is expected to result in a total of \$424 million less construction costs than the downtown station. This station site would have low potential impacts on cultural resources, biological resources, and hydrology. This site would have a greater potential for property acquisition than the downtown station. There is a majority of ethnic minority and low income population near the station area.</p>



Station Name (Alignment)	Discussion
<b>Stockton</b>	
<b>Stockton Downtown ACE</b> (BNSF express loop and UPRR express loop)	<p>The Stockton downtown (ACE) station has high ridership potential, maximizes connectivity with good freeway access and bus transit services, and would share the site with ACE commuter rail and present Amtrak services. Intercity ridership forecasts estimate between 1.1 and 1.7 million total boardings and alightings annually by 2020. The station is estimated to cost \$10.0 million.<sup>56</sup></p> <p>This station would have low potential impacts on cultural resources, biological resources, and hydrology. It could potentially impact parklands. There is a majority of ethnic minority and low income population near the station area. Improvements to this existing station area would potentially impact and benefit the surrounding community.</p>
<b>Modesto</b>	
<b>Amtrak Briggsmore</b> (BNSF)	<p>The Amtrak Briggsmore station is about 5 mi (8 km) east of downtown Modesto. This is the site of a new Amtrak station with direct connection to Amtrak services and bus services. Intercity ridership forecasts estimate between 1.3 and 1.7 million total boardings and alightings annually by 2020 for the Modesto HST station. The station is estimated to cost \$ 32.4 million.</p> <p>The Amtrak Briggsmore station option would have low potential impacts on cultural resources, biological resources, and hydrology. This option could have potential impacts to parkland.</p>
<b>Downtown Modesto SP</b> (UPRR)	<p>The downtown Modesto station maximizes connectivity to downtown Modesto, and provides convenient access to SR-99 and good bus transit access. This option through downtown Modesto would be on an aerial structure and have considerable construction issues as compared to the Amtrak Briggsmore site. Intercity ridership forecasts estimate between 1.3 and 1.7 million total boardings and alightings annually by 2020 for the Modesto HSR station (same as for the Amtrak Briggsmore option). The station is estimated to cost \$165 million.</p> <p>The downtown Modesto station would have low potential impacts on biological resources and hydrology, but would have medium/high potential impacts on cultural resources. There is a majority of ethnic minority and low income population near the station area.</p>

<sup>56</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
<b>Merced</b>	
<b>Downtown Merced UPRR</b> (UPRR/BNSF)	<p>The downtown Merced station is located near the city center and transit hub of Merced, has good access to SR-99, is located at the bus transit hub for Merced, and would have the highest level of connectivity of the three Merced locations. Intercity ridership forecasts estimate between 0.4 and 0.5 million total boardings and alightings annually by 2020 for each of the Merced HST station options (assuming a Pacheco Pass alignment to connect to the Bay Area). The downtown Merced option would have higher construction issues than the other station options which are located outside of the Merced urban area, and four tracks would be needed through downtown Merced to accommodate express services. The station is estimated to cost \$32.4 million.</p> <p>The downtown Merced station would have low potential impacts on biological resources and stream crossings and low/medium potential impacts on cultural resources. This site would have high potential floodplains impacts (18 ac [7 ha]) and would potentially impact 1.2 ac (0.5 ha) of parkland. There is a majority of ethnic minority and low income population near the station area. Although express trains would run through Merced at speeds of about 220 mph (354 kph), potential noise impacts through Merced are expected to be moderate because of mostly commercial and industrial land uses adjacent to the freight railroad. Many of the potential noise impacts could be offset by grade separating the adjacent freight services and eliminating horn noise and noise from warning gates.</p>
<b>Downtown Merced UPRR</b> (UPRR/BNSF with express loop)	<p>This option would have two tracks through Merced (for HST service stopping in Merced) and two tracks on a new alignment outside the Merced urban area for express services that would bypass Merced. This option would have the same connectivity and ridership potential as the downtown Merced option.</p> <p>The downtown Merced station is expected to cost \$10.0 million.<sup>57</sup> The express loop would decrease construction issues and costs through downtown Merced, but would increase overall capital costs by \$267 million because of 12.8 mi (20.6 km) of additional alignment construction required for the express loop.</p> <p>With this option, only HST trains stopping in Merced (and traveling at reduced speeds) would go through Merced. Noise would be reduced through Merced because there would be fewer trains, traveling at slower speeds. However, analysis for express loops in the Central Valley suggests that there would be only an estimated 12–16% reduction in potential noise impacts by moving the high-speed mainline (express) tracks outside urbanized areas. The relatively modest decrease in potential noise impacts is attributed to three factors: 1) there would be some potential residential impacts along the new express loop, 2) much of the surrounding land uses of the freight line through downtown Merced are industrial/commercial, and 3) the express loop results in potential noise impacts on two corridors as opposed to one.</p> <p>The express loop would potentially impact an additional 127–135 ac (51–55 ha) of farmland, and this new alignment would have potential severance impacts on farmlands. The express loop would potentially impact an additional 24–28 acres (10–11 ha) of wetlands, 4–5 stream crossings, and 280 ac (113 ha) more floodplains. This potential station site would have potential minority population impacts.</p>

<sup>57</sup> Local service station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
<b>Castle Air Force Base</b> (BNSF using UPRR through urban Merced)	<p>The Castle AFB site is about 7 mi (11 km) from downtown Merced but would provide easy access to the developing UC Merced campus via a new highway alignment along Bellevue Avenue. This option would have less connectivity and accessibility than the downtown Merced station option but is estimated to have similar intercity ridership and revenue.</p> <p>This option would have an additional two-track express loop constructed on new alignment to serve the Castle AFB station site. This option would have fewer potential construction impacts (since only two tracks would be required through Merced). The station itself is expected to cost \$32.4 million.</p> <p>This Castle AFB option would have low potential impacts on cultural resources and biological resources. This station option would have potential minority population impacts. However, it is surrounded by agricultural land that is not compatible with HST service.</p> <p>Castle loop would have about the same potential biological impacts as the downtown Merced station option (without the Castle loop). It would have 10 ac (4 ha) more floodplains, 1 more stream crossing, 3 ac (1 ha) more of parkland, and more potential impacts on cultural resources (25 more known cultural resources). Potential noise impacts through Merced would be about the same as the downtown Merced station option.</p>
<b>Castle Air Force Base</b> (BNSF using new alignment around urban Merced)	<p>The Castle AFB site is about 7 mi (11 km) from downtown Merced, but would provide easy access to the developing UC Merced campus via a new highway alignment along Bellevue Avenue. This option would have less connectivity and accessibility than the downtown Merced station option but is estimated to have similar intercity ridership and revenue.</p> <p>This option would have an additional two-track new alignment loop line constructed to serve Castle AFB station site and a new alignment around Merced to bypass the urban area. This option would eliminate potential construction impacts through Merced but would have potential land use and farmland impacts along the new alignment. The station itself is expected to cost \$32.4 million.</p> <p>The option would have low potential impacts on cultural and biological resources. This station option would have potential minority population impacts. It is surrounded by agricultural land that is not compatible with HST service. This option would potentially impact an additional 50–65 ac (20–26 ha) of farmlands and would have 127–135 ac (51–55 ha) of farmland with potential severance impacts. This option is estimated to reduce potential noise impacts through Merced by 12–16%.</p>
<b>Merced Municipal Airport</b> (UPRR/BNSF)	<p>The Merced Municipal Airport site would be less than 2 mi (3 km) from downtown Merced. This option would have less connectivity and accessibility than the downtown Merced station option but is estimated to have similar intercity ridership and revenue.</p> <p>This option would have 12.8 mi (20.6 km) of new alignment around Merced to bypass the urban area. This option would eliminate potential construction impacts through Merced and is estimated to cost \$283 million less than an alignment through downtown Merced. The station itself is expected to cost \$32.4 million.</p> <p>The option would have low potential impacts on cultural and biological resources. There is a majority of ethnic minority and low income population near the station area. However, it is surrounded by agricultural land that is not compatible with HST service and would potentially impact 12 ac (5 ha) more floodplains than the Downtown Merced option. The alignment for this station option would potentially impact an additional 50–65 ac (20–26 ha) of farmlands but would have 127–135 ac (51–55 ha) of farmland with potential severance impacts. The alignment would also potentially impact an additional 45 ac (18 ha) of floodplains, but would have fewer potential cultural impacts. This option is estimated to reduce potential noise impacts through Merced by 12–16%.</p>

Station Name (Alignment)	Discussion
<b>Fresno</b>	
<b>Downtown Fresno</b> (UPRR/BNSF)	<p>The downtown Fresno station option would have high ridership potential and connectivity and accessibility, with good freeway access and good connections to bus transit. Intercity ridership forecasts estimate between 2.5 and 3.2 million total boardings and alightings annually by 2020. The downtown Fresno option would have high construction issues, and four tracks would be needed through downtown Fresno to accommodate express service. The station is estimated to cost \$32.5 million.</p> <p>The downtown Fresno station would have low potential impacts on biological resources and stream crossings but have high potential impacts on cultural resources. This site would have high potential floodplains impacts (13 ac [5 ha]). There is a majority of ethnic minority and low income population near the station area. Although express trains would run through Fresno at speeds of about 220 mph (354 kph), potential noise impacts through much of Fresno are expected to be moderate because of mostly commercial and industrial land uses adjacent to the freight railroad. Where the alignment is at grade, some of the potential noise impacts could be offset by grade separating the adjacent freight services and eliminating horn noise and noise from warning gates. The alignment is expected to have 6 mi (10 km) of aerial structure through Fresno and 8 mi (13 km) of potentially high noise impacts.</p>
<b>Downtown Fresno</b> (UPRR/BNSF with express loop)	<p>This option would have two tracks through Fresno (for HST service stopping in Fresno) and two tracks on a new alignment outside the Fresno urban area for express services that would bypass Fresno. This option would have the same connectivity and ridership potential as the downtown Fresno option. There is a majority of ethnic minority and low income population near the downtown station area.</p> <p>The downtown Fresno station for the two stopping tracks is expected to cost \$10.0 million.<sup>58</sup> The express loop would decrease construction issues and costs through downtown Fresno (since only two tracks would be required), but would increase overall capital costs by \$707 million as a result of 22 mi (35 km) of additional alignment construction for the UPRR option, and \$790 million as a result of 26 mi (42 km) of additional alignment construction for the BNSF option.</p> <p>With this option, only HST trains stopping in Fresno (and traveling at reduced speeds) would go through Fresno. Noise would be reduced through Fresno since there would be fewer trains, traveling at slower speeds. However, a focused study on the Fresno loop line suggests that there would be only an estimated 12–16% reduction in potential noise impacts by moving the high-speed mainline (express) tracks outside the urbanized areas. The relatively modest decrease in potential noise impacts is attributed to three factors: 1) there would be some potential residential impacts along the new express loop, 2) much of the surrounding land uses of the freight line through downtown Fresno are industrial, and 3) the express loop results in potential noise impacts on two corridors as opposed to one.</p> <p>The express loop would potentially impact an additional 224–293 ac (91–119 ha) of farmland, and this new alignment would have potential severance impacts on farmlands. The express loop would potentially impact an additional 40 ac (16 ha) of wetlands, 5–7 stream crossings, and 5–7 ac (2–3 ha) more floodplains. This station option would potentially have impacts on minority population.</p>

<sup>58</sup> Local service station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
<b>Tulare and Kings Counties</b>	
<b>Hanford</b> (BNSF)	<p>The Hanford site would connect to the Amtrak station in Hanford. The BNSF serves Hanford and would result in faster travel times and lower access costs for Hanford residents and Kings County. Intercity ridership forecasts estimate between 140,000 and 160,000 total boardings and alightings annually by 2020 for a Tulare/Kings County station. The station is estimated to cost \$28.7 million.</p> <p>The Hanford station option would have low potential impacts on biological resources and hydrology, and medium/high potential cultural impacts. There is a majority of ethnic minority and low income population near the station area.</p>
<b>Visalia Airport</b> (UPRR)	<p>The Visalia Airport station would best serve the more populated Tulare County cities of Visalia and Tulare. The UPRR serves Visalia and would result in faster travel times and lower access costs for the Visalia population and Tulare County. Intercity ridership forecasts estimate 140,000–160,000 total boardings and alightings annually by 2020 for a Tulare/Kings County station. The station is estimated to cost \$28.7 million.</p> <p>The Visalia Airport station option would have low potential impacts on cultural resources, biological resources, and hydrology.</p>
<b>Bakersfield Area</b>	
<b>Truxton</b> (UPRR)	<p>The Truxton station would have the highest connectivity of the three locations being evaluated to serve Bakersfield. The Truxton station would connect to the new Bakersfield Amtrak Station and is in the city center of Bakersfield, within walking distance of the convention center and City Hall. The Truxton station location also has good access to SR-99. The Truxton station would have high ridership potential. Intercity ridership forecasts estimate between 1.9 and 2.6 million total boardings and alightings annually by 2020. The Truxton station would have higher construction costs and construction issues than the other Bakersfield station options, and is estimated to cost \$32.4 million for the Union Avenue station option, and \$165 million for the Amtrak station option.</p> <p>The Truxton station option would have low potential impacts on biological resources, medium/high potential impacts on cultural resources, and a high percentage of residential land uses that would not be compatible with an HST station. There is a majority of ethnic minority and low income population near the station area.</p>
<b>Golden State</b> (UPRR)	<p>The Golden State station site is less than 2 mi (3 km) northeast of the city center next to SR-204. This station would have less accessibility and connectivity than the Truxton station option. Intercity ridership forecasts suggest similar ridership potential as the Truxton station. This station option is estimated to cost \$32.2 million.</p> <p>The Golden State station site would have low potential impacts on biological resources, and medium potential impacts on cultural resources. This option would potentially impact 12.4 ac (5.0 ha) of parkland and 26 ac (11 ha) of wildlife habitat.</p>

Station Name (Alignment)	Discussion
<b>Bakersfield Airport</b> (UPRR)	<p>The Bakersfield Airport station would be located outside of Bakersfield, about 6 mi (10 km) northeast of the city center. The airport station would provide a high level of connectivity to the airport and has good access to SR-99, but would have the least connectivity and accessibility of the three Bakersfield station options because of distance from downtown. Intercity ridership forecasts suggest similar ridership potential as the Truxton station. This station option is estimated to cost \$32.4 million.</p> <p>The Bakersfield Airport station option would have low potential impacts on biological resources, medium/high potential impacts on cultural resources, and potential impacts on 25 ac (10 ha) of wildlife habitat.</p>

## 6.4 BAKERSFIELD TO LOS ANGELES REGION

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

### 6.4.1 Bakersfield to Sylmar Alignment Options

All information presented is for the area from Bakersfield to Sylmar. This segment is shown in Figure 6.4-1.

		I-5	SR-58/Soledad Canyon Corridor (Antelope Valley)
		Union Avenue	Wheeler Ridge
Physical/Operational Characteristics			
<b>Alignment Description</b>	This alignment extends east along UPRR from a Bakersfield station, south along Union Avenue, and generally follows I-5 over the Tehachapi Mountains through Santa Clarita to Sylmar. No station options considered in this segment.	This alignment extends east along UPRR from a Bakersfield station, south along SR-184/Wheeler Ridge Road, and generally follows I-5 over the Tehachapi Mountains through Santa Clarita to Sylmar. No station options considered in this segment.	This alignment extends east from Bakersfield along SR-58, generally following SR-58 through the Tehachapi Mountains to Mojave, along Metrolink/UPRR through Antelope Valley and Soledad Canyon, and generally following SR-14 from Santa Clarita to Sylmar. Palmdale Transportation Center is the only station option considered in this segment.
<b>Length in miles (km)</b>	84 mi (135 km)	87 mi (140 km)	120 mi (193 km)
<b>Cost<sup>59</sup> (dollars)</b>	\$6.48 billion	\$6.58 billion	\$6.46 billion
<b>Travel Time (min)</b>	33 min	34 min	45 min  For express trips passing through this segment as part of a longer trip (e.g., Los Angeles to San Francisco or Sacramento), this alignment option adds 10 min to long-distance travel time).

<sup>59</sup> Segment Cost Begins at a common point after Bakersfield Golden Station at Roxford Street.

	<b>I-5</b>		<b>SR-58/Soledad Canyon Corridor (Antelope Valley)</b>
	<b>Union Avenue</b>	<b>Wheeler Ridge</b>	
<b>Ridership</b>	The I-5 alignment options have higher projected annual system-wide intercity ridership (1.7 million annual passengers, more by 2020 using the low-end forecast) than the Antelope Valley option (30.3 million) due to the shorter travel times between major northern California markets (San Francisco Bay Area and Sacramento) and southern California markets (Los Angeles and San Diego). However, the I-5 options do not directly serve the Antelope Valley.		Provides direct service to Palmdale/Lancaster area. Lower intercity ridership than I-5 options because of longer travel times between major northern California markets (San Francisco Bay Area and Sacramento) and southern California markets (Los Angeles and San Diego). There is a high potential for commute ridership between Palmdale and Los Angeles on this alignment. The commute ridership is estimated to be 1.7 million more annually than the I-5 options by 2020.
<b>Constructability</b>	This section of the alignment crosses five or six major seismic faults through the Tehachapi Mountains and has 23 mi (37 km) of tunnels with long sections (more than 5 mi [8 km]) at Tejon Ranch and through the Angeles National Forest. It would be one of the most challenging sections of the HST system to construct.		This section of the alignment crosses three major seismic faults through the Tehachapi Mountains and has 13 mi (21 km) of tunnels. This option provides less abrupt terrain than the I-5 options, which would result in considerably less tunneling overall, shorter tunnels (maximum tunnel length of 3.4 mi [5.5 km]) and fewer constructability issues through the mountains. This option would have considerable sections of construction adjacent to existing rail and highway corridors through the urban areas of Palmdale and Lancaster. Services would need to be maintained on these adjacent facilities during construction. It would be one of the most challenging sections of the HST system to construct.
<b>Operational Issues</b>	<p>Average speed: 153 mph (246 kph) Maximum speed: 186–217 mph (299–349 kph)</p> <p>The I-5 alignment options have more than 20 mi (33 km) of sustained grades above 3.0%. These sustained grades reduce train speed and increase power consumption.</p>		<p>Average speed: 161 mph (259 kph) Maximum speed: 186–217 mph (299–349 kph)</p> <p>The Antelope Valley alignment option has a more gradual profile than the I-5 options with only 14 mi (22.5 km) of sustained grades over 3.0%.</p>



		I-5	SR-58/Soledad Canyon Corridor (Antelope Valley)
		Union Avenue	Wheeler Ridge
Potential Environmental Impacts			
<b>Travel Conditions</b>		<p>The I-5 alignment options would have the fastest express times between northern and southern California. Express times would be about 10 min less than the SR-58/Soledad Canyon alignment, and local times would be about 12 min less. For example, the San Francisco to Los Angeles express travel time would be approximately 2 hr 25 min for the I-5 alignment options, and just over 2 hr 35 min for the SR-58/Soledad Canyon alignment. The I-5 alignment options would not directly serve the Antelope Valley.</p>	<p>The travel times between San Francisco and Los Angeles on the SR-58/Soledad Canyon option would be 2 hr 35 min, or about 10 min longer than the I-5 alignment. The SR-58/Soledad Canyon option includes a potential station at Palmdale, whereas the I-5 options do not have any stations between Bakersfield and Sylmar. The potential Palmdale station would have a positive effect on connectivity since it would serve the growing communities of the Antelope Valley. Trip time between Palmdale and Los Angeles would be about 26 min. The SR-58/Soledad Canyon alignment would also improve travel times, and reduce access costs to/from the Antelope Valley population.</p>
<b>Noise and Vibration:</b> <sup>60</sup> High, medium, and low potential impacts		<p>Low potential impacts.</p> <p>The HST Alternative has low potential noise impact ratings along both the I-5 and Antelope Valley alignment options because of the sparseness of residential land use and open space along most of these two routes. The I-5 alignment options would require more tunneling through the open space and natural areas, which would result in fewer potential operational noise impacts on wildlife and hiking trails.</p>	<p>Low potential impacts on overall segment. Medium potential impacts in the Palmdale area.</p> <p>The HST Alternative has low potential noise impact ratings along both the I-5 and Antelope Valley options because of the sparseness of residential land use and open space along most of these two routes. There would be medium potential impacts in the more urban areas of Palmdale and Lancaster. More of the Antelope Valley option passes through populated areas than the I-5 options.</p>

<sup>60</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	I-5		
	Union Avenue	Wheeler Ridge	SR-58/Soledad Canyon Corridor (Antelope Valley)
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	Compatible, although most of the alignment would be in new right-of-way because it is adjacent to the existing road (I-5). Alignment would be constructed primarily in tunnels is considered compatible.  Environmental Justice: Minority populations exist and would not be affected.  Community: High potential impacts; the alignment divides an established residential community.  Property: Low potential impacts.	Compatible, although most of the alignment would be in new right-of-way because it is adjacent to the existing road (I-5). Alignment would be constructed primarily in tunnels and is considered compatible.  Environmental Justice: Minority populations exist at points along the alignment option  Community: Low potential impacts.  Property: Low potential impacts.	Not compatible in Palmdale because of additional right-of-way necessary for alignment.  Environmental Justice: Minority populations exist at points along the alignment option  Community: Low potential impacts.  Property: High potential impacts due to the alignment passing through Palmdale and Lancaster.
<b>Farmlands:</b> <sup>61</sup> Ac (ha) of farmlands	Farmlands: 20 ac (8 ha)	Farmlands: 63 ac (25 ha)	Farmlands: 0 ac (0 ha)

<sup>61</sup> The farmland resources study area is defined as 50 ft (15 m) on each side of alignment centerline (100 ft [30 m] total) when the alignment is separate from an existing rail corridor. When the alignment is adjacent to an existing rail corridor, the study area would extend 100 ft (30 m) from the rail right-of-way on the side the alignment would run.

	I-5		SR-58/Soledad Canyon Corridor (Antelope Valley)
	Union Avenue	Wheeler Ridge	
<b>Aesthetics and Visual Resources:</b> Number of viewing points and high potential contrast/impact areas	<p>2 viewing points: Pyramid Lake scenic viewing point and Castaic Lake scenic viewing point, 0.4 mi (0.64 km) and 0.7 mi (1.13 km)</p> <p>High potential contrast impacts from elevated structure and catenary at edge of Pyramid Lake adjacent to I-5, and cut and fill and tunnel portals in hillside of Santa Clarita Woodlands Park.</p>		<p>1 viewing point: Tehachapi Loop Marker, 0.7 mi. (1.13 km) of alignment.</p> <p>Contrast with historic Tehachapi Pass Rail, and high contrast from cut and fill in hillside for about 12 mi (19 km).</p> <p>The elevated guideway and catenary across the scenic Sierra Highway and adjacent to Santa Clara River SEA (Significant Ecological Area) would contrast with the existing landscape features. Cut and fill and tunnel portals would be visible against natural open space hillsides and ridges in Angeles National Forest. Would affect 1.1 mi (1.8 km) of scenic highway (Sierra Highway in City of Palmdale). The elevated guideway potentially has shadow impacts.</p>
<b>Cultural Resources and Paleontological Resources:</b> <sup>62</sup> Potential presence of historical resources in area of potential effect	<p>0.18 known archeological sites per mi</p> <p>Based on records searches, the I-5 options have lower potential to encounter cultural resources than the Antelope Valley option. Long tunnels further reduce the potential for cultural resources impacts.</p>	<p>0.20 known archeological sites per mi</p> <p>Based on records searches, the I-5 options have lower potential to encounter cultural resources than the Antelope Valley option. Long tunnels further reduce the potential for cultural resources impacts.</p>	<p>0.31–1.30 known archeological sites per mi</p> <p>The Antelope Valley option would be more sensitive for cultural resources than the I-5 alignment options.</p>

<sup>62</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

	<b>I-5</b>		<b>SR-58/Soledad Canyon Corridor (Antelope Valley)</b>
	<b>Union Avenue</b>	<b>Wheeler Ridge</b>	
<b>Hydrology and Water Resources:</b> <sup>63</sup> Potential impacts and associated ac (ha) of floodplains, linear ft (m) of streams, and ac (ha) of lakes within potential impact study areas	<p>Floodplains: 163 ac (66 ha) Streams: 30,491 linear ft (9,294 linear m) Lakes: 18 ac (7 ha)</p> <p>Higher potential for affecting floodplains than Antelope Valley option, primarily due to large areas of floodplain between Bakersfield and the base of the Tehachapi Mountains at Grapevine.</p>	<p>Floodplains: 408 ac (165 ha) Streams: 25,363 linear ft (7,731 linear m) Lakes: 18 ac (7 ha)</p> <p>Higher potential for affecting floodplains than Antelope Valley option, primarily due to large areas of floodplain between Bakersfield and the base of the Tehachapi Mountains at Grapevine.</p>	<p>Floodplains: 317 ac (128 ha) Streams: 57,326 linear ft (17,473 linear m) Lakes: 0 ac (0 ha)</p> <p>Lower overall potential for water-related impacts because the potential impacts are due to the relatively small seasonal streams in Soledad Canyon between Palmdale and Sylmar, and the alignment would not encroach on any lakes.</p>
<b>Biological Resources, Including Wetlands:</b> <sup>64</sup> Ac (ha) of wetlands, ac (ha) of sensitive vegetation (vegetation), number of special-status species (species), and linear ft (m) of non-wetland waters (waters)	<p>Wetlands: 239 ac (97 ha) Vegetation: 780 ac (316 ha) Species: 14 species Waters: 96,096 linear ft (29,290 linear m)</p> <p>The I-5 options would potentially impact slightly more sensitive plant communities and wetlands than the Antelope Valley alignment. However more of the route would be in tunnel, limiting the exposure of the HST to biological resources.</p>	<p>Wetlands: 241 ac (98 ha) Vegetation: 824 ac (333 ha) Species: 13 species Waters: 96,096 linear ft (29,290 linear m)</p> <p>The I-5 options would potentially impact slightly more sensitive plant communities and wetlands than the Antelope Valley alignment. However more of the route would be in tunnel, limiting the exposure of the HST to biological resources.</p>	<p>Wetlands: 169 ac (68 ha) Vegetation: 482 ac (195 ha) Species: 23 species Waters: 835,296 linear ft (254,598 linear m)</p> <p>The Antelope Valley alignment option would potentially impact more sensitive plant and wildlife species and more wildlife movement/migration corridors than the I-5 options. Overall, the Antelope Valley option would have slightly more potential impacts on biological resources than the I-5 options.</p>

<sup>63</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>64</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

	I-5		SR-58/Soledad Canyon Corridor (Antelope Valley)
	Union Avenue	Wheeler Ridge	
<b>Section 4(f) and 6(f) Resources:</b> <sup>65</sup> Number of resources rated high (potential direct effects)	Resources rated high: 5  Alignment option would potentially impact Fort Tejon Historical Park, Angeles and Los Padres National Forests, Hungry Valley State Vehicular Recreation Area, and Pyramid Lake.	Resources rated high: 8  Alignment option would potentially impact Fort Tejon Historical Park, Angeles and Los Padres National Forests, Hungry Valley State Vehicular Recreation Area, Pyramid Lake, and other local parks along Wheeler Ridge.	Resources rated high: 0  The alignment would not go through major parks such as Angeles National Forest. There are only medium potential impacts on historical resources in Palmdale and Lancaster.
<b>Growth Induced Impacts:</b> Ac (ha) of urbanized area required in addition to baseline forecast	Low potential impact.  Because these alignment options would have no stations between Bakersfield and Los Angeles, urban development is forecasted to be more concentrated in the Central Valley, and consequently slightly more land would be urbanized surrounding the Central Valley stations to accommodate the growth, as compared to the Antelope Valley option.		Low potential impact.  This option includes a station at Palmdale in the Antelope Valley of Los Angeles County. The station at Palmdale is forecasted to increase projected urbanized land in Los Angeles County by more than 2,250 ac (911 ha). Due to increased travel times associated with this alignment, the Palmdale option would also slightly reduce requirements for urbanized land in nearly every study area county because of reduced population and employment growth. In total, the reductions in other counties would outweigh the increase in Los Angeles County, resulting in a net decrease in statewide urbanized area of approximately 2,100 ac (850 ha) in 2035. This option is forecasted to result in less farmland conversion (about 2,800 ac [1,133 ha] less) than the I-5 option in 2035.

<sup>65</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

### 6.4.2 Sylmar to Los Angeles Alignment Options

All information presented is for the area from Sylmar to Los Angeles. This segment is shown in Figure 6.4-2.

Metrolink/UPRR		Combined I-5/UPRR
Physical/Operational Characteristics		
<b>Alignment Description</b>	This alignment extends southeast generally following the Metrolink/UPRR between Sylmar and Los Angeles Union Station (LAUS) area. It is assumed that the alignment would be generally at grade between Burbank and downtown Los Angeles. There is an aerial option over I-5 and I-10 between Burbank and LAUS. Station options considered in this segment include Sylmar, Burbank, and the LAUS area.	This alignment extends southeast following UPRR from Sylmar to Burbank Metrolink station, and then generally follows I-5 to a tunnel under Elysian Park to the LAUS area. The assumed configuration for the I-5 option is aerial from south of Burbank station to south of Glendale Boulevard, then cut and cover to south of Stadium Way. Additionally, there is an aerial option from south of Burbank station to south of Stadium Way. Station options considered in this segment include Sylmar, Burbank, and the LAUS area.
<b>Length in miles (km)</b>	23–25 mi (37–40 km)	24–25 mi (39–40 km)
<b>Cost<sup>66</sup> (dollars)</b>	\$2.11 billion	\$2.09 billion
<b>Travel Time (min) Roxford to Los Angeles Union Station</b>	11–12 min (depending on LAUS option)	11 min
<b>Ridership</b>	Ridership for these two alignment options would be about the same.	
<b>Constructability</b>	This alignment is a combination of at-grade, trench, and aerial construction.	This alignment is also a combination of at-grade, trench, and aerial construction, but could also require approximately 2 miles (3.2 km) of tunneling at Silver Lake. The aerial and tunneling sections are due to right-of-way constraints.
<b>Operational Issues Roxford to Los Angeles Union Station</b>	Average speed: 131 mph (211 kph) Maximum speed: 155–186 mph (249–299 kph)	Average speed: 131 mph (211 kph) Maximum speed: 155–186 mph (249–299 kph)

<sup>66</sup> Segment cost begins at Roxford Street.

Metrolink/UPRR		Combined I-5/UPRR
Potential Environmental Impacts		
<b>Noise and Vibration:</b> <sup>67</sup> High, medium, and low potential impacts	<p>Medium potential impacts.</p> <p>There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings. Potential noise impacts would be medium where the alignment is at grade between Burbank and Los Angeles. If the alignment were aerial where it crosses the I-5 and I-10, the potential noise impacts would be higher.</p>	<p>Medium potential impacts.</p> <p>Where the alignment would be aerial between Burbank and to just south of Glendale Boulevard, the potential noise impacts would be medium. However, between Glendale Boulevard and south of Stadium Way, where the alignment would be in tunnel, the potential noise impacts would be low. If the alignment were aerial between Burbank and Stadium Way, the potential noise impacts would be considerably higher.</p>
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Not compatible because of need for new right-of-way.</p> <p>Environmental Justice: Minority populations are present at points along the alignment option</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p>	<p>Not compatible because the alignment cuts through low-density residential areas. If cut and cover were used at Silver Lake, the alignment would be compatible because it would not divide the community.</p> <p>Environmental Justice: Minority populations are present at points along the alignment option</p> <p>Community: Low potential impacts.</p> <p>Property: Low–medium potential impacts.</p>
<b>Aesthetics and Visual Resources:</b> Number of viewing points and high potential contrast/impact areas	<p>It is assumed that this alignment would be at grade between Burbank and Glendale Avenue and would consequently have low to medium potential impacts. Between Glendale Avenue and Los Angeles, the alignment would be at grade and consequently would have medium potential impacts. If the aerial option were used between Glendale Boulevard and Los Angeles, there could be higher potential impacts due to higher contrast areas and shadows.</p>	<p>It is assumed that this alignment between Burbank and Glendale Avenue would be at grade and aerial, and would consequently have medium potential impacts due to high contrast and potential shadow impacts. From south of Glendale Boulevard to south of Stadium Way, it would be in tunnel, having few potential visual impacts. However, if the tunnel section between Glendale Boulevard and south of Stadium Way were aerial, there could be higher potential impacts due to higher contrast areas and shadows.</p>

<sup>67</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Metrolink/UPRR	Combined I-5/UPRR
<b>Hydrology and Water Resources:</b> <sup>68</sup> Potential impacts and associated ac (ha) of floodplains, linear ft (m) of streams, and ac (ha) of lakes within potential impact study areas	<p>Floodplains: 0 ac (0 ha)</p> <p>Streams: 1,724–3,408 linear ft (525–1,039 linear m) (depending on LAUS option)</p> <p>Lakes: 0 ac (0 ha)</p> <p>This is a predominantly urban environment.</p>	<p>Floodplains: 10 ac (4 ha)</p> <p>Streams: 0–1,650 linear ft (0–503 linear m) (depending on LAUS option)</p> <p>Lakes: 0 ac (0 ha)</p> <p>This is a predominantly urban environment.</p>
<b>Biological Resources Including Wetlands:</b> <sup>69</sup> Ac (ha) of wetlands, ac (ha) of sensitive vegetation (vegetation), number of special-status species (species), and linear ft of non-wetland waters (waters)	<p>Wetlands: 34 ac (14 ha)</p> <p>Vegetation: 0</p> <p>Species: 2</p> <p>Waters: 15,312 linear ft (4,667 linear m)</p> <p>This is a predominantly urban environment.</p>	<p>Wetlands: 108 ac (44 ha)</p> <p>Vegetation: 1</p> <p>Species: 0</p> <p>Waters: 24,288–34,320 linear ft (7,403–10,461 linear m)</p> <p>The I-5 route would potentially impact slightly more biological resources than the Metrolink/UPRR route. The I-5 route could potentially impact one sensitive plant community, whereas the Metrolink/UPRR route potentially would not impact any. The I-5 route would also encounter more non-wetland waters than the Metrolink/UPRR route. This is a predominantly urban environment.</p>
<b>Section 4(f) and 6(f) Resources:</b> <sup>70</sup> Number of resources rated high (potential direct effects)	<p>Resources rated high: 0–3 depending on LAUS option</p> <p>From Sylmar to downtown Los Angeles, generally the Metrolink/UPRR alignment option has fewer potential impacts than the I-5 option because there are fewer local and regional parks.</p> <p>Both the Metrolink and I-5 alignments are rated high for potential presence of historical resources.</p>	<p>Resources rated high: 4–5 depending on LAUS option</p> <p>From Sylmar to downtown Los Angeles, generally the Metrolink/UPRR alignment option has fewer potential impacts than the I-5 option because there are fewer local and regional parks. The I-5 option has potential impacts on Griffith Park and Elysian Park.</p> <p>Both the Metrolink and I-5 alignments are rated high for potential presence of historical resources.</p>

<sup>68</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>69</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>70</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.



### 6.4.3 Bakersfield to Los Angeles Station Options

Station Name (Alignment)	Discussion
<b>Palmdale/Antelope Valley</b>	
<b>Palmdale Transportation Center</b> (SR-58/Soledad Canyon)	<p>The Palmdale Transportation Center would potentially serve the Antelope Valley population. This station option maximizes opportunities for intermodal connectivity. It is close to Palmdale Airport, with the opportunity for convenient shuttle or people-mover service, and it is the Metrolink station for Palmdale and a hub for local bus services. The Palmdale Transportation Center would reduce travel times and access costs for the Antelope Valley population. More than 1.3 million total intercity boardings and alightings are expected at this station annually by 2020 (low end forecast).</p> <p>The Palmdale Transportation Center is estimated to cost \$32.4 million. The station would be at grade.</p> <p>Minority populations are present in the vicinity of this station option. It would have a potentially high impact on streams (6,586 linear ft [2,007 m]). There are four special-status species in the vicinity of the station. One Section 4(f) and 6(f) resource, the Sierra Highway Greenbelt, could be affected by the station.</p>
<b>Sylmar</b>	
<b>Sylmar Metrolink</b> (Metrolink/UPRR and combined I-5/UPRR)	<p>The Sylmar Metrolink station would provide a direct connection to the Metrolink regional commuter rail service. This potential station location would have convenient access to the freeway network. Between approximately 2.5 and 3.5 million total intercity boardings and alightings are expected at this station annually by 2020.</p> <p>The Sylmar Metrolink station is estimated to cost \$172 million. The station would be an aerial structure.</p> <p>Although there are no recorded archeological sites in this station area, there is a large potential for buried prehistoric sites. This station would potentially affect 2,640 linear ft (805 m) of non-wetland waters, and one plant and one wildlife species. Two Section 4(f) and 6(f) resources could be affected by this station, Recreation Park and Layne Park in San Fernando.</p>
<b>Burbank</b>	
<b>Burbank Metrolink Media City</b> (Metrolink/UPRR and combined I-5/UPRR)	<p>The Burbank Metrolink station would provide the highest connectivity to the Burbank area. This station site is in downtown Burbank, has a direct connection to the Metrolink regional commuter rail service, is a hub for bus transit in the Burbank area, has adjacent access to I-5, and is only 2.4 mi (3.9 km) from Burbank Airport. Between about 2.9 and 5.4 million total intercity boardings and alightings are expected annually at this station by 2020.</p> <p>The Burbank Metrolink station is estimated to cost \$ 172 million and would be aerial.</p> <p>There would be a potentially high impact on historical structures because of the historical structures surrounding the station. This station would potentially affect 3,168 linear ft (966 m) of non-wetland waters, 11 ac (4 ha) of perennial wetlands, and one plant species. Additionally, 1,384 linear ft (422 m) of streams could be affected. Griffith Manor Park, a potential Section 4(f) and 6(f) resource in Glendale, could be affected by the station.</p>

Station Name (Alignment)	Discussion
<b>Burbank Airport</b> (Metrolink/UPRR and combined I-5/UPRR)	<p>The Burbank Airport station would be nearer to Burbank Airport (1.6 mi [2.6 km]), but would be outside the city center and would not connect with a Metrolink station or regional transit. The intercity ridership potential is expected to be about the same as the Burbank Metrolink station option.</p> <p>The Burbank Airport station is estimated to cost \$366 million. The station would be in a trench, making it considerably more difficult and expensive to build than the downtown station.</p> <p>There would be a high potential impact on historical structures because of the historical structures surrounding the station. This station would potentially affect 6 ac (2 ha) of wetlands.</p>
<b>Los Angeles</b>	
<b>Los Angeles Union Station</b> (Metrolink/UPRR)	<p>The existing LAUS station has the best connectivity and therefore would also provide the fastest overall travel times. LAUS is the transit/rail transportation hub of southern California. LAUS is the primary destination for the Metrolink Commuter rail services, the Los Angeles Metro Red Line, the Pasadena Gold Line, the Amtrak Surfliner service, and the regional bus transit services. HST would serve LAUS on an elevated structure, and transfers to other modes would be made directly under HST platforms. LAUS would have between 9 and 15.3 million annual intercity boardings and alightings by 2020, which is the highest ridership of all stations in the entire system.</p> <p>LAUS is estimated to cost \$96.3 million.<sup>71</sup> It would be an elevated structure constructed over the current Metrolink and Amtrak tracks. For service to Inland Empire/San Diego via the UPRR Riverside/UPRR Colton alignment option, and for service to Orange County and LAX, the HST alignment at LAUS would continue south (over US-101). The UPRR Colton alignment option to Inland Empire/San Diego would require the LAUS station site to remain a stub-end station, requiring trains traveling from northern California to Inland Empire and San Diego that stop at LAUS to reverse directions (increasing travel times between these markets by at least 10 min).</p> <p>The existing LAUS site would have limited potential impacts on the environment. Minority populations are present in the vicinity of this station. The El Pueblo de Los Angeles State Historic Park could be affected, particularly during construction, by the addition of the HST system. Also given the proximity of the station to the historic district, this area is considered to have high potential for impacts on cultural resources.</p>

<sup>71</sup> Costs would be reduced for this station because of lower design speed for station stopping tracks, which requires less infrastructure and right-of-way.

Station Name (Alignment)	Discussion
<b>Los Angeles Union Station South</b> (Metrolink/UPRR)	<p>The LAUS south site would require the construction of a pedestrian bridge/plaza across US-101 to connect with LAUS. The LAUS south station would have similar intercity ridership potential as the LAUS option. For service to Inland Empire/San Diego via the UPRR Riverside/UPRR Colton alignment option, and for service to Orange County and LAX, the HST alignment at LAUS would continue south (over US-101). The UPRR Colton alignment option to Inland Empire/San Diego would require the LAUS station site to remain a stub-end station for trains traveling from northern California to Inland Empire and San Diego (increasing travel times between their markets by at least 10 min).</p> <p>The station would be constructed across the US-101 corridor, creating a new aerial terminal that would have to connect via bridge to the existing LAUS. The LAUS south station would cost \$96.3<sup>72</sup> million to build.</p> <p>There would be a high potential impact on historical structures because of the historical structures surrounding LAUS, which is itself a historical structure. The station would affect 2,112 linear ft (644 m) of non-wetland waters. No Section 4(f) or 6(f) resources would be directly affected by this station.</p>
<b>Los Angeles River East</b> (Metrolink/UPRR)	<p>The Los Angeles River east station site would require the construction of a pedestrian bridge/plaza across US-101 to connect with LAUS. The Los Angeles River east station would have intercity ridership potential similar to the LAUS option. For service to Inland Empire/San Diego via the UPRR Colton alignment option, the HST alignment at the Los Angeles River east station would continue east on an aerial structure. This station site would not serve the UPRR Riverside/UPRR Colton alignment option to Inland Empire/San Diego or the links to Orange County or LAX.</p> <p>The aerial station would be constructed across the East River from the existing LAUS and would constitute a new station and structure. The station is estimated to cost \$96.3 million.*</p> <p>There would be a high potential impact on historical structures because of the historical structures surrounding the rail yards and LAUS, which is itself a historical structure. The station would affect 3,696 linear ft (1,127 m) of non-wetland waters. No Section 4(f) or 6(f) resources would be directly affected by this station. There would be low potential impacts on biological resources in this station area.</p>

<sup>72</sup> Costs would be reduced for this station because of lower design speed for station stopping tracks, which requires less infrastructure and right-of-way.

## 6.5 LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

This region of southern California includes the eastern portion of the Los Angeles Basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

### 6.5.1 Los Angeles to March Air Reserve Base Alignment Options

All information presented is for the area from Los Angeles to March Air Reserve Base (ARB). This segment is shown in Figure 6.5-1.

Union Pacific Railroad (UPRR)				
	Colton Line	Riverside/Colton Line	Colton Line to San Bernardino	Riverside/Colton/San Bernardino
Physical/Operational Characteristics				
<b>Alignment Description</b>	The Colton alignment would potentially begin at LAUS and follow the UPRR Colton Line to March ARB. Station options considered in this segment include El Monte, Pomona, Ontario, Colton, and UC Riverside.	The Riverside/Colton alignment would potentially begin at LAUS and would follow the UPRR Riverside Line to Pomona. From Pomona to March ARB, the alignment would follow the UPRR Colton Line. Station options considered in this segment include South El Monte, City of Industry, Ontario, and UC Riverside.	The Colton/San Bernardino alignment would potentially begin at LAUS and would follow the UPRR Colton Line to Ontario Airport. From Ontario Airport, the alignment would move north into San Bernardino, continue to Santa Fe station, turn south on the BNSF San Jacinto Line, and continue south on I-215 to March ARB. Station options considered in this segment include El Monte, Pomona, Ontario, San Bernardino, and UC Riverside.	The Riverside/Colton/San Bernardino alignment would potentially begin at LAUS and would follow the UPRR Riverside Line to Pomona. From Pomona to Ontario Airport, the alignment would follow the UPRR Colton Line, move north into San Bernardino, continue to Santa Fe station, turn south on the BNSF San Jacinto Line, and continue south on I-215 to March ARB. Station options considered in this segment include South El Monte, City of Industry, Ontario, San Bernardino, and UC Riverside.
<b>Length in miles (km)</b>	68 mi (109 km)	68 mi (109 km)	75 mi (121 km)	74 mi (119 km)
<b>Cost (dollars)</b>	\$4.10 billion	\$2.91 billion	\$4.82 billion	\$3.62billion
<b>Travel Time (min)</b>	33 min	35 min	39 min	41 min

Union Pacific Railroad (UPRR)				
	Colton Line	Riverside/Colton Line	Colton Line to San Bernardino	Riverside/Colton/San Bernardino
<b>Ridership</b>	Would provide the shortest and fastest route between Los Angeles and March ARB. The UPRR Colton alignment option to Inland Empire/San Diego enters LAUS and Union Station South from the north, requiring a direction reversal using LAUS as a stub-end station for trains traveling from Inland Empire to northern California (e.g., San Francisco and Sacramento), increasing travel times between these markets by at least 10 min. LA River Station East could provide through service for trains between these markets.	Would provide the second shortest and fastest route. The Riverside/Colton alignment option to Inland Empire/San Diego would allow through tracks at LAUS and Union Station South. This alignment would not provide service to the LA River Station East.	Would provide service to downtown San Bernardino. The UPRR Colton alignment option to Inland Empire/San Diego enters LAUS and Union Station South from the north, requiring a direction reversal using LAUS as a stub-end station for trains traveling from Inland Empire to northern California (e.g., San Francisco and Sacramento) increasing travel times between these markets by at least 10 min. LA River Station East could provide through service for trains between these markets.	Would provide service to downtown San Bernardino. The Riverside/Colton alignment option to the Inland Empire/San Diego would allow through tracks at LAUS Station and Union Station south. This alignment would not provide service to the LA River East Station.
<b>Constructability</b>	All alignment options would require construction in an urban environment, while maintaining rail service within the adjacent existing corridor.			
<b>Operational Issues</b>	<p>Average speed: 110 mph (177 kph)</p> <p>Maximum speed: 186–215 mph (299–346 kph)</p> <p>Requires trains bound to points north of Los Angeles to change direction at LAUS and Union Station South. LA River Station East could provide through service to points north of Los Angeles.</p>	<p>Average speed: 117 mph (188 kph)</p> <p>Maximum speed: 186–215 mph (299–346 kph)</p> <p>This alignment would not serve LA River Station East.</p>	<p>Average speed: 115 mph (185)</p> <p>Maximum speed: 186–215 mph (299–346 kph)</p> <p>Requires trains bound to points north of Los Angeles to change direction at LAUS and Union Station South. LA River Station East could provide through service to points north of Los Angeles.</p>	<p>Average speed: 110 mph (177 kph)</p> <p>Maximum speed: 186–215 mph (299–346 kph)</p> <p>This alignment would not serve LA River Station East.</p>

Union Pacific Railroad (UPRR)				
	Colton Line	Riverside/Colton Line	Colton Line to San Bernardino	Riverside/Colton/San Bernardino
Potential Environmental Impacts				
<b>Travel Conditions</b>	For the alignment segment between Los Angeles and Riverside, the UPRR Colton and UPRR Riverside would serve the same basic populations and the same number of potential stations in about the same travel time.		These alignment options would provide service to San Bernardino, one of the largest Inland Empire cities, via a station in Colton. Because these alignment options are not as direct as the UPRR Colton or UPRR Riverside/Colton options, the alignment distance would be approximately 6 mi [9.7 km] longer, and the travel time would be approximately 6 min longer than the Colton or Riverside/Colton alignment.	
<b>Noise and Vibration:</b> <sup>73</sup> High, medium, and low potential impacts	<p>High potential impacts.</p> <p>High potential impacts due to proximity of residential land use along the Los Angeles to East San Gabriel Valley segment. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.</p>	<p>Medium potential impacts.</p> <p>Medium potential impacts due to proximity of alignment to industrial/commercial land uses. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.</p>	<p>High potential impacts.</p> <p>High potential impacts due to proximity of residential land use along the Los Angeles to East San Gabriel Valley and the San Bernardino segments. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.</p>	<p>High potential impacts.</p> <p>High potential impacts due to proximity of residential land use along the San Bernardino segment. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.</p>

<sup>73</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

Union Pacific Railroad (UPRR)				
	Colton Line	Riverside/Colton Line	Colton Line to San Bernardino	Riverside/Colton/San Bernardino
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatible.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Medium potential impacts.</p> <p>Traverses mostly developed urban areas adjacent to an existing rail corridor with industrial, commercial, and residential uses. The residential uses are concentrated in the San Gabriel area. About 26% of the length would have high potential impacts on property.</p>	<p>Compatible.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Medium potential impacts.</p> <p>Traverses mostly developed urban areas adjacent to an existing rail corridor with industrial, commercial, and some residential uses. About 30% of length would have high potential impacts on property.</p>	<p>Not compatible with existing land use because of loop through low-density areas in San Bernardino. However, the potential San Bernardino station site is within a redevelopment area, which would support an HST station in the future.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Medium potential impacts.</p> <p>Traverses mostly developed urban areas adjacent to an existing rail corridor with industrial, commercial, and residential uses (particularly in the San Bernardino Area). More potential property impacts than the UPRR Colton or Riverside/Colton alignments. 33% of the length would have high potential impacts on property.</p>	

Union Pacific Railroad (UPRR)				
	Colton Line	Riverside/Colton Line	Colton Line to San Bernardino	Riverside/Colton/San Bernardino
<b>Hydrology and Water Resources:</b> <sup>74</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	<p>Floodplains: 132 ac (53 ha) Streams: 20,750 linear ft (6,325 linear m)</p> <p>Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.</p>	<p>Floodplains: 57 ac (23 ha) Streams: 38,120 linear ft (11,619 linear m)</p> <p>Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.</p>	<p>Floodplains: 148 ac (60 ha) Streams: 15,470 linear ft (4,715 linear m)</p> <p>Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.</p>	<p>Floodplains: 115 ac (47 ha) Streams: 32,840 linear ft (10,010 linear m)</p> <p>Traverses mostly developed urban areas with channelized watercourses. Potential impacts would be limited due to use of existing rail corridors. Because stream crossings have already been accomplished, these alignments would not result in new crossings or disturbances to these resources.</p>
<b>Biological Resources Including Wetlands:</b> <sup>75</sup> Ac (ha) of wetlands and ac (ha) number of special-status species (species)	<p>Wetlands: 3.34 ac Species: 16</p> <p>Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore, potential for impacts would be limited.</p>	<p>Wetlands: 3.34 ac Species: 15</p> <p>Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore, the potential for impacts would be limited.</p>	<p>Wetlands: 1.58 ac Species: 13</p> <p>Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore, the potential for impacts would be limited.</p>	<p>Wetlands: 1.58 ac Species: 12</p> <p>Traverses mostly developed urban areas. Due to existing development, there are few wetlands and wildlife resources present along the proposed alignment. Therefore the potential for impacts would be limited.</p>

<sup>74</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>75</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.



Union Pacific Railroad (UPRR)				
	Colton Line	Riverside/Colton Line	Colton Line to San Bernardino	Riverside/Colton/San Bernardino
<b>Section 4(f) and 6(f) Resources:</b> <sup>76</sup> Number of resources rated high (potential direct effects)	Resources rated high: 7  Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.	Resources rated high: 9  Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.	Resources rated high: 9  Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.	Resources rated high: 11  Alignment would be along or adjacent to existing right-of-way and could potentially impact local parks.

<sup>76</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

### 6.5.2 March Air Reserve Base to Mira Mesa Alignment Options

All information presented is for the area from March ARB to Mira Mesa. This segment is shown in Figure 6.5-2.

I-215/I-15	
Physical/Operational Characteristics	
<b>Alignment Description</b>	The I-215/I-15 alignment would begin at March ARB and follow the existing I-215 and then I-15 corridor to Mira Mesa. The majority of the alignment would follow or be adjacent to the existing transportation corridor. Station options considered in this segment include March ARB (cost not included), Temecula/Murrietta, and Escondido (I-15 or Escondido Transit Center).
<b>Length in miles (km)</b>	73 mi (117 km)
<b>Cost (dollars)</b>	\$3.97 billion (with I-15 Escondido station) \$4.89 billion (with Escondido Transit Center station)
<b>Travel Time (min)</b>	32 min
<b>Ridership</b>	This alignment would serve the I-15 corridor well, regardless of which Escondido station option were chosen.
<b>Constructability</b>	Substantial earthwork along this alignment could require additional right-of-way or extensive retaining walls. Existing traffic flow would need to be maintained during construction.
<b>Operational Issues</b>	Average speed: 153–215 mph (246–346 kph) Maximum speed: 186–217 mph (299–349 kph)  This alignment is relatively straight and flat through undeveloped land and rural/suburban communities, thus allowing for operating speeds over 200 mph (322 kph).
Potential Environmental Impacts	
<b>Travel Conditions</b>	No rail corridor exists between March ARB and Mira Mesa. This alignment would provide options to increase accessibility, connectivity, and capacity to major suburban areas of Los Angeles and San Diego.
<b>Noise and Vibration:</b> <sup>77</sup> High, medium, and low potential impacts	Low to medium potential impacts.  There would be low potential impacts between March ARB and Escondido, and medium potential impacts (from the Escondido Transit Center alignment and station option) between Escondido and Mira Mesa. This is largely due to the larger population south of Escondido compared to north of Escondido.

<sup>77</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	I-215/I-15
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatible.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>Since this area is largely undeveloped, this alignment would have few potential land use impacts.</p>
<b>Cultural Resources and Paleontological Resources:</b> <sup>78</sup> Potential presence of historical resources in area of potential effect	High potential impacts. March ARB to Mira Mesa has high potential for archeological resources. The mountainous terrain just south of Temecula is considered to contain important traditional tribal cultural areas.
<b>Hydrology and Water Resources:</b> <sup>79</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	<p>Floodplains: 112 ac (45 ha)</p> <p>Streams: 31,100–32,270 linear ft (9,479–9,836 linear m)</p> <p>Most of the potential impacts on streams and floodplains could be mitigated through typical engineering solutions.</p>
<b>Biological Resources Including Wetlands:</b> <sup>80</sup> Ac (ha) of wetlands, number of special-status species (species), and linear ft (m) of non-wetland waters (waters)	<p>Wetlands: 405 ac (164 ha)</p> <p>Species: 30–37</p> <p>Waters: 109,978 linear ft (33,521 linear m)</p> <p>Wildlife species potentially impacted include 15 sensitive species. A total of 109,978 ft (33,521 m) of non-wetland waters of the U.S. and 405 ac (164 ha) of wetlands would potentially be impacted. March ARB to Escondido would result in potential impacts to jurisdictional waters.</p>

<sup>78</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

<sup>79</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>80</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

	I-215/I-15
<b>Section 4(f) and 6(f) Resources:</b> <sup>81</sup> Number of resources rated high (potential direct effects)	<p>Resources rated high: 15–16, depending on station option at Escondido</p> <p>The parks in this region are primarily unnamed local parks with recreational uses stretching the length of the corridor.</p>

<sup>81</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

### 6.5.3 Mira Mesa to San Diego Alignment Options

All information presented is for the area from Mira Mesa to San Diego. This segment is shown in Figure 6.5-3.

Carroll Canyon		Miramar Road	I-15 to Qualcomm Stadium
Physical/Operational Characteristics			
<b>Alignment Description</b>	Undeveloped land and parkland comprise a considerable share of land use. The alignment follows an existing transportation corridor. The corridor traverses Carroll Canyon from Mira Mesa to the University City Station, connects to LOSSAN corridor, and terminates in downtown San Diego. The alignment is next to the north side of the Miramar Naval Air Station (NAS). Station options considered in this segment include University City, San Diego Airport, and downtown San Diego.	Undeveloped land and parkland comprise a considerable share of land use. The alignment follows an existing transportation corridor. The Miramar Road alignment would provide the most direct route from Mira Mesa along Miramar Road to University City Amtrak Station, connect to LOSSAN corridor, and terminate in downtown San Diego. The alignment is adjacent to the north side of the Miramar Naval Air Station (NAS). Station options considered in this segment include Mira Mesa, University City, and downtown San Diego.	Undeveloped land and parkland comprise a considerable share of land use. The alignment follows the I-15 alignment to Qualcomm Stadium. This alignment, along with the existing I-15 corridor, would bisect the Miramar NAS. Station options considered in this segment include Mira Mesa and Qualcomm.
<b>Length in miles (km)</b>	19 mi (31 km)	19 mi (31 km)	9 mi (14 km)
<b>Cost (dollars)</b>	\$1.42 billion	\$1.35 billion	\$1.28 billion
<b>Travel Time (min)</b>	14 min	14 min	7 min
<b>Ridership</b>	Would provide direct service to downtown San Diego and have higher potential for commute ridership than I-15 to Qualcomm option.	Would provide most direct service to downtown San Diego and have higher potential for commute ridership than I-15 to Qualcomm option.	Would provide highest potential for intercity ridership. The low-end ridership analysis estimates 350,000 more intercity passengers for this option than the downtown options by 2020. Would not provide direct service to downtown San Diego but would provide the shortest travel time to the greater San Diego area. The station location would be an 8-mi (13-km) drive or 10-mi (16-km) (20-min) ride on light-rail transit (LRT) to the city center.

	<b>Carroll Canyon</b>	<b>Miramar Road</b>	<b>I-15 to Qualcomm Stadium</b>
<b>Constructability</b>	This alignment would require construction in a sensitive and remote area, and along the heavily constrained LOSSAN rail corridor as it enters San Diego from the north. Existing rail services would need to be maintained during construction.	This alignment would require construction in a densely suburban area, along an existing roadway, and along the heavily constrained LOSSAN rail corridor as it enters San Diego from the north. Existing traffic and rail services would need to be maintained during construction.	This alignment would require substantial earthwork and additional right-of-way or extensive retaining walls. Existing traffic flow would need to be maintained during construction. This alignment would be the shortest to be constructed relative to other alignment options.
<b>Operational Issues</b>	Average speed: 84 mph (135 kph) Maximum speed: 124–155 mph (200–249 kph)	Average speed: 84 mph (135 kph) Maximum speed: 124–155 (200–249 kph)	Average speed: 77 mph (124 kph) Maximum speed: 124–155 (200–249 kph)
<b>Potential Environmental Impacts</b>			
<b>Travel Conditions</b>	The Carroll Canyon alignment and the Miramar Road alignment would directly serve downtown San Diego. The Carroll Canyon alignment option provides an alternative to the potential Mira Mesa station at University City. The Carroll Canyon and Miramar Road alignment options would provide considerably shorter travel times to downtown San Diego than the I-15 to Qualcomm Stadium alignment (including alternative travel from Qualcomm to downtown).		The I-15 to Qualcomm alignment would have the shortest line-haul times (about 7 min less than the two options to downtown San Diego), but would not directly serve downtown San Diego. The in-train travel time for the light-rail between Qualcomm and the downtown San Diego Santa Fe Depot is more than 20 min.
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Moderately compatible (alignment would follow existing transportation corridor, therefore reducing potential impacts).</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Medium potential impacts.</p> <p>Carroll Canyon option would pass well to the north of Miramar NAS, thereby avoiding potential impacts.</p>	<p>Moderately compatible (alignment would follow existing transportation corridor, therefore reducing potential impacts).</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>This alignment is directly adjacent to Miramar NAS on an aerial structure.</p>	<p>Moderately compatible (alignment would follow existing transportation corridor, therefore reducing potential impacts).</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>This alignment bisects Miramar NAS along the I-15 corridor, but it is assumed to be in tunnel throughout Miramar NAS.</p>

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
<b>Aesthetics and Visual Resources</b>	<p>High potential impacts.</p> <p>At-grade route would cut through a residential neighborhood and an open space area. Elevated structures would also pass through a city center area and directly in front of high-rise residences, adversely affecting views and creating the potential for impacts.</p>	<p>High potential impacts.</p> <p>Elevated structure would be visible from residential neighborhoods and Balboa Park, creating moderate to high levels of visual contrast. Elevated structures would also pass through a city center area and directly in front of high-rise residences, adversely affecting views and creating the potential for impacts.</p>	<p>Low potential impacts.</p> <p>There are few aesthetic and visual resources along the I-15 corridor.</p>
<b>Cultural Resources and Paleontological Resources:</b> <sup>82</sup> Potential presence of historical resources in area of potential effect	<p>High potential impacts.</p> <p>High potential for historical resources through downtown San Diego.</p>	<p>High potential impacts.</p> <p>High potential for historical resources through downtown San Diego.</p>	<p>Low potential impacts.</p> <p>Low potential for historical resources.</p>
<b>Hydrology and Water Resources:</b> <sup>83</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	<p>Floodplains: 162 ac (66 ha) Streams: 5,130 linear ft (1,564 m)</p> <p>Carroll Canyon would have the lowest potential impacts on streams, but the highest on floodplains. The Miramar corridor crosses several flood-prone areas and has several streams feeding the area.</p>	<p>Floodplains: 130 ac (53 ha) Streams: 5,860 linear ft (1,786 m)</p> <p>Miramar Road would have similar potential impacts as the Carroll Canyon alignment. The Miramar corridor runs within several flood-prone areas and has several streams feeding the area.</p>	<p>Floodplains: 40 ac (16 ha) Streams: 9,960 linear ft (3,036 m)</p> <p>The I-15 option would have potential impacts on streams. The I-15 corridor is considered a flood-prone area and has several streams feeding the area.</p>

<sup>82</sup> The archaeological area of potential effect is defined as 500 ft (152 m) on each side of the alignment centerline for new routes requiring additional right-of-way, and 100 ft (30 m) on each side of the centerline for routes along existing highways and railroads, where very little additional right-of-way would be required. The study area for paleontological resources is defined as 100 ft (30 m) on each side of alignment centerline.

<sup>83</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	Carroll Canyon	Miramar Road	I-15 to Qualcomm Stadium
<b>Biological Resources Including Wetlands:</b> <sup>84</sup> Ac (ha) of wetlands and number of special-status species (species)	<p>Wetlands: 352 ac (142 ha) Species: 24</p> <p>Characterized by a predominance of southern riparian scrub and potential encounters with more non-wetland waters (as a result of the canyon alignment) than the other two alignment options. Wetlands would be dominated by estuarine wetlands along the coast, with a greater amount of vernal pool wetlands than the Miramar Road alignment. This alignment would be expected to result in potential impacts on wildlife habitat and movement corridors, as well as to encounter threatened and endangered species and species of special concern.</p>	<p>Wetlands: 303 ac (123 ha) Species: 22</p> <p>Characterized by a predominance of mixed chaparral and southern riparian scrub and a potential encounter with a substantial amount of non-wetland waters. Wetlands would be dominated by estuarine areas along the coast, with some vernal pool wetlands in the interior portion of the segment. The Los Peñasquitos Canyon Preserve near Miramar NAS is a considerable regional wildlife and linkage corridor that might also be potentially impacted. This alignment would be expected to result in potential impacts on wildlife habitat and movement corridors, as well as to encounter threatened and endangered species and species of special concern.</p>	<p>Wetlands: 337 ac (136 ha) Species: 11</p> <p>Characterized by a predominance of mixed chaparral and a potential encounter with a substantial amount of non-wetland waters (similar in quantity to the Miramar Road alignment). Wetlands would be dominated by palustrine and vernal pool wetlands, with a quantity of vernal pool wetlands similar to the Carroll Canyon alignment option. This alignment would be expected to result in potential impacts on wildlife habitat and movement corridors, as well as to encounter threatened and endangered species and species of special concern.</p>
<b>Section 4(f) and 6(f) Resources:</b> <sup>85</sup> Number of resources rated high (potential direct effects)	<p>Resources rated high: 5</p> <p>The Section 4(f) and 6(f) resources in this corridor are primarily local parks, including the Rose Canyon Open Space Preserve. There are more potential impacts on cultural and historical resources closer to downtown San Diego.</p>	<p>Resources rated high: 5</p> <p>Like the Carroll Canyon alignment, the Section 4(f) and 6(f) resources in this corridor are primarily local parks, including the Rose Canyon Open Space Preserve and the Miramar Memorial Golf Course. There are more potential impacts on cultural and historical resources closer to downtown San Diego.</p>	<p>Resources rated high: 9</p> <p>This alignment contains a higher number of unnamed local parks than the other two corridors, primarily because of the suburban development of the area.</p>

<sup>84</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>85</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.



	<b>Carroll Canyon</b>	<b>Miramar Road</b>	<b>I-15 to Qualcomm Stadium</b>
<b>Growth-Induced Impacts</b>	<p>Low potential impacts.</p> <p>Growth is forecasted to be more concentrated in the urban (downtown) areas.</p>	<p>Low potential impacts.</p> <p>Growth is forecasted to be more concentrated in the urban (downtown) areas.</p>	<p>High potential impacts.</p> <p>Moving the terminal site from downtown San Diego to East Mission Valley is projected to increase the size of the urbanized area by about 11,500 ac (4,654 ha) (more than 2%) in 2035.</p>

#### 6.5.4 Los Angeles to San Diego Station Options

Station Name (Alignment)	Discussion
<b>East San Gabriel Valley</b>	
<b>City of Industry Metrolink</b> (UPRR Riverside/UPRR Colton)	<p>The Metrolink station site at City of Industry would have a wide range of multimodal connections to local and regional bus services, and Metrolink commuter rail service. The City of Industry site would provide a central location between the potential stations at LAUS and Ontario Airport. This station site would also have good access to the freeway network. The City of Industry station site would be served by the UPRR Riverside/Colton alignment option. The forecasted ridership (boardings and alightings) would be between 4.8 and 10.2 million annual intercity passengers in 2020.</p> <p>The City of Industry station would be at grade, allowing for easier and less expensive construction of the facility. The station is estimated to cost \$28.7 million.</p> <p>There are few environmental issues with this site, except incompatibility with current land use. The surrounding area is primarily low density residential and would not be compatible with a train station.</p>
<b>Pomona Metrolink</b> (UPRR Colton and UPRR Riverside/Colton)	<p>The Metrolink station site at Pomona would have a wide range of multimodal connections to local and regional bus services, and Metrolink commuter rail service. This station site would also provide good access to the freeway network. The Pomona station site would be served by both the UPRR Colton and UPRR Riverside/Colton alignment options. The Pomona Metrolink station would have high potential ridership. The intercity ridership (boardings and alightings) would be similar to the City of Industry station option forecast.</p> <p>The station would be an aerial structure next to the existing at-grade Metrolink Station. Expected cost is \$165 million.</p> <p>The Pomona station has few environmental issues. However, there is one Section 4(f) and 6(f) resource within 150 ft (46 m) of the station. This unnamed park could be affected by station activities.</p>
<b>El Monte</b> (UPRR Colton)	<p>The El Monte station site would have good freeway access, but would only serve the UPRR Colton Line. The intercity ridership (boardings and alightings) would be similar to the City of Industry station forecasts.</p> <p>The El Monte station would be at grade, which would make construction easier and less expensive than if it were an aerial structure. The station is estimated to cost \$27.0 million.</p> <p>There are few environmental issues with this site. However, the surrounding area is primarily low density residential and would not be compatible with a train station.</p>
<b>South El Monte</b> (UPRR Riverside/UPRR Colton)	<p>The South El Monte station site would have good freeway access but would only serve the UPRR Riverside/UPRR Colton Line. The intercity ridership (boardings and alightings) would be similar to the City of Industry station option forecasts.</p> <p>Like the El Monte station, the South El Monte station would be at grade, which would make construction easier and less expensive than if it were an aerial structure. The station is estimated to cost \$27.0 million.</p> <p>Like the City of Industry station location, there are few environmental issues with this site, except incompatibility with current land use. The surrounding area is primarily low density residential and would not be compatible with a train station. The station would have a medium potential impact on streams, and would potentially affect 1,500 linear ft (457 linear m) of non-wetland waters.</p>

Station Name (Alignment)	Discussion
<b>Ontario Airport</b>	
<b>Ontario Airport</b> (UPRR Colton and UPRR Riverside/UPRR Colton)	<p>The Ontario airport station would provide a multi-modal connection to Ontario International Airport and link to regional bus transit services. The Ontario airport station would provide the fastest HST travel times and reduce access costs for passengers to Ontario International Airport. The forecasted intercity ridership (boardings and alightings) would be between 1.0 and 2.2 million annual intercity passengers in 2020.</p> <p>The station would be at grade, costing approximately \$ 27.0 million. Since it is next to a functioning airport, particular construction techniques may need to be employed to avoid interference with airport ground and airside operations, which could have cost implications.</p> <p>There are few environmental issues with this station location.</p>
<b>East San Bernardino County/Riverside County</b>	
<b>San Bernardino Santa Fe Depot</b> (Riverside/Colton/San Bernardino)	<p>The San Bernardino station site would have the widest range of multimodal connections to local and regional bus services, and Metrolink commuter rail service. The forecasted intercity ridership would be similar to the UC Riverside station option forecasts.</p> <p>The San Bernardino station would be an aerial station, which is more expensive than at-grade construction. The estimated cost of the station would be \$ 86.4 million.<sup>86</sup></p> <p>There are several environmental issues with the San Bernardino station site. There would be high visual contrast in downtown San Bernardino because it would travel through primarily low density residential areas. It would also have high potential shadow impacts. This station would be incompatible with the surrounding residential area; however, the station is in a redevelopment area with future planned uses that would be consistent with the HST station. Minority populations are present in the vicinity of this station option.</p>
<b>UPRR Colton</b> (UPRR Colton and UPRR Riverside/UPRR Colton)	<p>The UPRR Colton station site would have the least connectivity to existing transit services, but it would have the most central location for serving both the San Bernardino and Riverside populations, and good accessibility to I-10. The intercity ridership would be similar to the UC Riverside station option forecasts.</p> <p>The station would be at grade, making it less expensive to build than the San Bernardino station. The estimated cost of this station is \$27.0 million.</p> <p>This station could affect 1,330 linear ft (405 m) of streams and 1,400 linear ft (427 m) of non-wetland waters.</p>
<b>University of California Riverside</b> (UPRR Colton and UPRR Riverside/UPRR Colton)	<p>The UC Riverside site is furthest away from the freeway network but provides for the most convenient access to Riverside. The forecasted ridership (boardings and alightings) would be between 2 and 4 million annual intercity passengers in 2020.</p> <p>The aerial station would cost \$86.4 million.<sup>87</sup></p> <p>This station could affect 690 linear ft (210 m) of streams and 1,500 linear ft (457 m) of non-wetland waters. There would be medium potential visual impacts in the residential areas near the station and along the corridor leading to the station.</p>

<sup>86</sup> Costs are reduced due to lower design speed for station stopping tracks, requiring less infrastructure and right-of-way.

<sup>87</sup> Costs are reduced due to lower design speed for station stopping tracks, requiring less infrastructure and right-of-way.

Station Name (Alignment)	Discussion
<b>March Air Reserve Base</b> (UPRR Colton and UPRR Riverside/UPRR Colton)	<p>The March ARB site would be adjacent to the air reserve base but would have the least connectivity, longest travel times, and highest access costs because it is farthest from the Riverside/San Bernardino populations, and the air reserve base does not serve commercial air passengers. The forecasted ridership (boardings and alightings) would be less than the other stations in this region in 2020.</p> <p>The station would be at grade, making it less expensive to build than the San Bernardino station. The estimated cost of this station is \$27.0 million.</p> <p>This station could affect 90 ac (36 ha) of coastal sage scrub and one Section 4(f) and 6(f) resource.</p>
<b>Temecula Valley</b>	
<b>Murrieta (I-15)</b>	<p>A potential station at Murrieta would serve the fast-growing Temecula/Murrieta area. The Murrieta station site would have convenient freeway access to both I-15 and I-215. The forecasted ridership (boarding and alighting) would be between 1.2 and 2.0 million annual intercity passengers in 2020.</p> <p>This aerial station would cost \$165 million.</p> <p>This station could affect 3,319 linear ft (1,012 m) of non-wetland waters and 640 linear ft (195 m) of streams.</p>
<b>Escondido</b>	
<b>Escondido Transit Center (I-15)</b>	<p>The Escondido Transit Center would have somewhat higher connectivity than the Escondido I-15 station. The Transit Center station would be closer to the Escondido Transit Center (within 1/8-mi) and provide better connectivity with the proposed Escondido-to-Oceanside commuter rail service. The forecasted ridership (boardings and alightings) would be between 1.8 and 2.8 million annual intercity passengers in 2020.</p> <p>This station would be in a trench or tunnel, which is the most expensive and difficult station type to build, and would cost \$366 million. The alignment to serve this station would require 5.9 mi (9.5 km) of tunneling, raising the cost of the alignment between March ARB and Mira Mesa by nearly \$500 million. This alignment would also add considerable construction issues and right-of-way constraints.</p> <p>The corridor leading to the transit center is incompatible with the surrounding low density residential properties; however, the HST station is compatible with the use of the Transit Center. There are also minority populations present around the station.</p>
<b>Escondido at SR-78/I-15 (I-15)</b>	<p>The Escondido I-15 site would provide more convenient freeway access. The intercity ridership (boardings and alightings) would be similar to the Escondido Transit Center station option forecasts.</p> <p>This aerial station would most likely be less expensive than the Escondido Transit Center station. The station would cost \$164 million.</p> <p>The station and corridor are considered moderately compatible with the surrounding land use. There are few other environmental concerns.</p>

Station Name (Alignment)	Discussion
<b>Mid-San Diego County</b>	
<b>Mira Mesa</b> (I-15)	<p>The Mira Mesa location would provide convenient access to the freeway and serve northern San Diego County. Mira Mesa could serve both options to San Diego (I-15/Qualcomm and San Diego Downtown via Carroll Canyon or Miramar Road). The forecasted ridership (boardings and alightings) would be between 0.9 and 1.4 million annual intercity passengers in 2020.</p> <p>This aerial station would cost \$164 million.</p> <p>This stations could affect 50 ac (20 ha) of wetlands.</p>
<b>University City</b> (Carroll Canyon and Miramar Road)	<p>The University City site could be served by the Coaster commuter rail service. This 'at-grade' station would cost \$33.4 million.</p> <p>The University City site would be located within a minority population and would have low potential impacts on biological resources, visual resources, public utilities, and cultural resources. There would be moderate potential impacts on geology due to seismic hazards and difficulty in excavations, hydrology and water quality due to the potential for erosion, and Section 4(f) and 6(f) lands at Mandell Weiss Eastgate Park.</p>
<b>San Diego</b>	
<b>Downtown San Diego Santa Fe Depot</b> (Miramar Road and maybe I-15 to Qualcomm)	<p>For service to San Diego, the downtown San Diego Santa Fe Depot site would have the highest connectivity. This station is located in the city center where many potential HST passengers could walk to destinations. The Santa Fe Depot is the terminus for the Coaster commuter rail service and the Amtrak Surfliner intercity service. It provides direct connections to San Diego LRT network and is a bus transit hub for San Diego. The intercity ridership forecasts concluded that the downtown San Diego Santa Fe terminus would have about 350,000 fewer passengers annually than the Qualcomm Stadium station option by 2020. The downtown station site would have considerably higher potential for serving long distance commuters than the Qualcomm site.</p> <p>The station would be an aerial structure with several stub-end tracks. It would be over the existing station tracks and would be difficult to construct while continuing operations of the other rail services below. The station is expected to cost \$115 million.</p> <p>There would be medium to high potential property impacts for stations in the downtown areas. There would be high potential visual impacts on the downtown area. There are approximately 18 ac (7 ha) of estuarine wetlands that would be affected.</p>
<b>San Diego Airport</b> (Miramar Road)	<p>San Diego International Airport is a unique airport because it is located adjacent to downtown San Diego and is 2 mi (3 km) from the city center. The San Diego airport station location would provide a convenient connection to the airport and directly connect with the regional bus network and a San Diego LRT station. Although the location would not have as good connectivity to the city center as the Santa Fe Depot site, it would have a better connection to I-5 and is expected to have similar intercity ridership potential as the downtown San Diego Santa Fe station site.</p> <p>The station would be an aerial structure with several stub-end tracks. It would be next to the airport and, similar to the Ontario airport station, might require special construction considerations for the ongoing operation of the airport. This could increase the cost of the station, which is expected to be \$115 million.</p> <p>There are few potential environmental impacts for this station area.</p>

Station Name (Alignment)	Discussion
<b>Qualcomm Stadium (I-15)</b>	<p>Qualcomm Stadium would provide a direct connection to the San Diego LRT network and good freeway access, but it would not have the same level of connectivity to the San Diego city center. The low-end ridership analysis estimates 350,000 more intercity passengers than the downtown option by 2020. The Qualcomm station would not provide direct service to downtown San Diego, but it would provide the shortest travel time to the greater San Diego area. The station location would be an 8-mi (13 km) drive or 10-mi (16 km) (20-min) ride on LRT to the city center. The forecasted ridership (boarding and alightings) would be between 5.4 and 11.4 million annual intercity passengers in 2020.</p> <p>The station would be an aerial structure with several stub-end tracks. The station is expected to cost \$115 million.</p> <p>There would be medium potential property impacts, and the station would affect 1,430 linear ft (436 m) of non-wetland waters.</p>

## 6.6 LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing LOSSAN rail corridor.

### 6.6.1 Los Angeles to Los Angeles International Airport Alignment Options

All information presented is for the area from Los Angeles to LAX. This segment is shown in Figure 6.6-1.

MTA Harbor Subdivision Alignment	
Physical/Operational Characteristics	
<b>Alignment Description</b>	The LAUS to LAX alignment would follow an existing rail corridor for the majority of the distance from LAUS to LAX. Station options considered in this segment include LAX Station.
<b>Length in miles (km)</b>	15.4 mi (24.8 km)
<b>Cost (dollars)</b>	\$1.93 billion
<b>Travel Time (min)</b>	13 min
<b>Ridership</b>	This alignment would provide a direct route to LAX.
<b>Constructability</b>	This alignment would require construction of at-grade and aerial structure segments. It would be on an aerial structure from LAUS to the MTA harbor subdivision, at grade to I-405, and then on aerial to the airport.
<b>Operational Issues</b>	Average speed: 69 mph (111 kph) Maximum speed: 93–124 mph (150–200 kph)
Potential Environmental Impacts	
<b>Travel Conditions</b>	If service to LAX is selected, frequencies to each station along the Los Angeles-Inland Empire-San Diego corridor could be less than if a single line south of Los Angeles were selected. If both LAX and the direct link to Orange County were selected in addition to the Los Angeles-Inland Empire-San Diego corridor, the potential frequency of service for each of these three corridors could be considerably reduced. However, if LAX is directly served by HST, the number of intermodal connections would be increased, the travel times and access costs to these markets would be decreased, and the competitiveness of the new mode for the southwest portions of Los Angeles County intercity transportation markets would be increased. If the airport is not directly served, local transportation (shuttle, regional transit, or the automobile) will be needed between LAUS and the airport, or to western Los Angeles County.
<b>Noise/Vibration:</b> <sup>88</sup> High, medium, and low potential impacts	High potential impacts. Dense urban area surrounding land uses. Speeds would be restricted under 100 mph (161 kph) for the majority of the alignment.

<sup>88</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

MTA Harbor Subdivision Alignment	
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatible.</p> <p>Environmental Justice: Low potential minority population impacts along alignment.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts along alignment. Potential impacts at the LAX station location.</p> <p>Although there are minority populations in the corridor, the alignment is largely within an existing right-of-way, therefore reducing the potential impacts. The final location and type of station at LAX could influence the ultimate impact of the station on the surrounding community.</p>
<b>Aesthetics and Visual Resources:</b> Potential high contrast/impact areas and possible shadow areas	<p>Medium potential impacts.</p> <p>Elevated track would be visible in urban corridor and would create shadows.</p>
<b>Hydrology and Water Resources:</b> <sup>89</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	<p>Floodplains: 5 ac (2 ha)</p> <p>Streams: 1,300 linear ft (396 linear m)</p> <p>Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.</p>
<b>Biological Resources Including Wetlands:</b> <sup>90</sup> Linear ft of non-wetland waters (waters) and number of special-status species (species)	<p>Waters: 2,960 linear ft (902 linear m)</p> <p>Species: 8</p> <p>Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.</p>
<b>Section 4(f) and 6(f) Resources:</b> <sup>91</sup> Number of resources rated high (potential direct effects)	<p>Resources rated high: 2</p> <p>Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.</p>

<sup>89</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

<sup>90</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>91</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.



### 6.6.2 Los Angeles Union Station to Orange County Alignment Options

All information presented is for the area from Los Angeles to Anaheim/Irvine. This segment is shown in Figure 6.6-2.

	HST Options			Conventional Improvements	
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor– HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)	LOSSAN Corridor– Non-electric (Highest level of improvement to Irvine)	LOSSAN Corridor– Non-electric (Lowest level of improvement to Irvine)
<b>Physical/Operational Characteristics</b>					
<b>Alignment Description</b>	This alignment would provide dedicated <sup>92</sup> HST service using an existing UPRR right-of-way. Station options considered in this segment include Norwalk and Anaheim Transportation Center.	This shared-use <sup>93</sup> alignment would provide HST service along the existing LOSSAN corridor, terminating at Anaheim Transportation Center. The segment from Union Station to Fullerton would have a total of four tracks. Station options considered in this segment include Norwalk, Fullerton Transportation Center, and Anaheim Transportation Center.	This shared-use <sup>94</sup> alignment would provide HST service along the existing LOSSAN corridor, terminating at Irvine Transportation Center. The segment from Union Station to Fullerton would have a total of four tracks. Station options considered in this segment include Norwalk, Fullerton Transportation Center, Anaheim Transportation Center, Santa Ana Regional Transportation Center, and Irvine Transportation Center.	This alignment would provide improved non-electric service along a fully grade-separated system, with bypass tracks at station locations. Station options considered in this segment include Norwalk, Fullerton Transportation Center, Anaheim Transportation Center, Santa Ana Regional Transportation Center, and Irvine Transportation Center.	This alignment would provide improved non-electric service along a partially grade-separated system. Station options considered in this segment include Norwalk, Fullerton Transportation Center, Anaheim Transportation Center, Santa Ana Regional Transportation Center, and Irvine Transportation Center.
<b>Length miles (km)</b>	28.8 mi (46.3 km)	30.1 mi (48.4 km)	43.9 mi (70.7 km)	43.9 mi (70.7 km)	43.9 mi (70.7 km)
<b>Cost (dollars)</b>	\$3.45 billion	\$1.20 billion	\$2.31 billion	\$1.59 billion	\$1.45 billion
<b>Travel Time (min)</b>	16 min	27 min	37 min	38 min	41 min

<sup>92</sup> *Dedicated HST* means only HST will operate on the alignment.

<sup>93</sup> *Shared-use* means that HST and other passenger rail service will operate on the same alignment.

<sup>94</sup> *Shared-use* means that HST and other passenger rail service will operate on the same alignment.

	HST Options			Conventional Improvements	
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor– HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)	LOSSAN Corridor– Non-electric (Highest level of improvement to Irvine)	LOSSAN Corridor– Non-electric (Lowest level of improvement to Irvine)
<b>Ridership</b>	Dedicated HST route provides fastest through-service with no capacity constraints from competing rail traffic.	Provides HST service to central Orange County but is frequency-constrained because of shared-use operations.	Extends HST services to south central Orange County but is frequency-constrained because of shared-use operations.	Requires transfer to HST system at LAUS.	Requires transfer to HST system at LAUS.
<b>Constructability</b>	Within existing rail right-of-way. Would require construction of at-grade, aerial structure, trenched and tunnel segments.	Within existing rail right-of-way. Would require additional right-of-way and construction of extensive grade separations while maintaining existing service.	Within existing rail right-of-way. Would require additional right-of-way and construction of extensive grade separations while maintaining existing service. Would require construction of trenched segments.	Within existing rail right-of-way. Would require additional right-of-way and construction of extensive grade separations while maintaining existing service. Would require construction of trenched segments.	Within existing rail right-of-way. Would require additional right-of-way and construction of partially grade-separated system while maintaining existing service.

	HST Options			Conventional Improvements	
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor– HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)	LOSSAN Corridor– Non-electric (Highest level of improvement to Irvine)	LOSSAN Corridor– Non-electric (Lowest level of improvement to Irvine)
<b>Operational Issues</b>	No dispatching conflicts with conventional freight or passenger trains due to the dedicated right-of-way for HST operations. Few sharp curves to limit speeds. Could support up to 20 trains per hour in each direction, depending on terminal station configuration.	Shared-use alignment with delays and capacity constraints due to other rail traffic. Operational analysis suggests range of between 18 and 45 HST trains a day in each direction, depending on schedule and the effectiveness of a joint operating plan that would have to be developed in partnership with Amtrak and Metrolink. These estimated HST service levels assumed 16 Amtrak and 29 Metrolink trains daily in each direction.  Improvements also benefit existing freight, passenger, and commuter services. The addition of a fourth track between Los Angeles and Fullerton would allow for the segregation of freight and passenger services, assuming additional modifications to track configurations approaching Fullerton and LAUS.		Potential delays from other rail traffic; fourth main track between Los Angeles and Fullerton would allow segregation of freight and passenger trains, assuming additional track modifications approaching Fullerton and LAUS. Improvements would also benefit existing freight, passenger, and commuter services.	Potential delays from other rail traffic; fourth track between Los Angeles and Fullerton would allow segregation of freight and passenger trains, assuming additional track modifications approaching Fullerton and LAUS. Remaining at-grade crossings would present a challenge for safety and reliability. In contrast, other alternatives offer improvements to safety and reliability. Improvements would also benefit existing freight, passenger, and commuter services.
<b>Potential Environmental Impacts</b>					
<b>Travel Conditions</b>	This alignment is the most direct alternative and has fastest travel time.  A new station in Norwalk would be located along the alignment. This alignment could also be extended to Irvine along	This alignment would operate along the existing rail corridor, providing fast travel times and direct service.  Infrastructure improvements would provide benefits to existing Amtrak and commuter rail services as well. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.		This alignment would operate along the existing rail corridor, providing fast travel times and feeder service to the HST system.  Infrastructure improvements would	This alignment would operate along the existing rail corridor, providing relatively fast travel times and feeder service to the HST system. Increased train frequencies at remaining at-grade crossings would have some potentially

	HST Options			Conventional Improvements	
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor– HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)	LOSSAN Corridor– Non-electric (Highest level of improvement to Irvine)	LOSSAN Corridor– Non-electric (Lowest level of improvement to Irvine)
	the existing LOSSAN corridor. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.			provide benefits to existing commuter rail services as well. The fully grade-separated LOSSAN corridor would improve traffic flow and reduce air pollution at existing rail crossings.	negative traffic impact.  Infrastructure improvements would provide benefits to existing commuter rail services as well.
<b>Noise and Vibration:</b> <sup>95</sup> High, medium, and low potential impacts	High potential impacts. Introduces new potential impacts in partially residential area on what is currently a sparsely used freight line.	Medium potential impacts. There would be an increase in noise levels due to increased frequency of trains consisting of HST, Amtrak, Metrolink, and BNSF trains at conventional speeds. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings. The grade crossing noise reduction (elimination of horn noise and gate noise from existing services) as a result of the grade separations would offset the increase in train frequencies		Medium potential impacts. There would be an increase in noise levels due to increased frequency of trains. There would be a reduction in noise levels due to the elimination of horn noise and gate noise from existing services as a result of the grade separations at some existing grade crossings.	High potential impacts. No reduction of noise at grade crossings due to the lack of a fully grade-separated corridor.

<sup>95</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	HST Options			Conventional Improvements	
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor– HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)	LOSSAN Corridor– Non-electric (Highest level of improvement to Irvine)	LOSSAN Corridor– Non-electric (Lowest level of improvement to Irvine)
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	Compatible. Environmental Justice: Minority populations are present at points along this alignment option.. Community: Low potential impacts. Property: Low potential impacts.	Compatible. Environmental Justice: Minority populations are present at points along this alignment option. Community: Low potential impacts. Property: High potential impacts.		Compatible. Environmental Justice: Minority populations are present at points along this alignment option. Community: Low potential impacts. Property: High potential impacts.	Compatible. Environmental Justice: Minority populations are present at points along this alignment option. Community: Low potential impacts. Property: High potential impacts.
<b>Aesthetics and Visual Resources:</b> Number of viewing points and potential high contrast/impact areas	Low potential impacts. No viewing points are located along this alignment. Potential impacts are medium to high contrast/ impact areas.	Low potential impacts. No viewing points are located along this alignment. Potential impacts are low to high contrast/impact areas.		Low potential impacts. No viewing points are located along this alignment. Potential impacts are low to high contrast/impact areas.	Low potential impacts. No viewing points are located along this alignment. Potential impacts are low to high contrast/impact areas.
<b>Hydrology and Water Resources:</b> <sup>96</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	Floodplains: 15 ac (6 ha) Streams: 650 linear ft (198 linear m)	Floodplains: 75 ac (30 ha) Streams: 3,265 linear ft (995 linear m)	Floodplains: 75 ac (30 ha) Streams: 3,265 linear ft (995 linear m)	Floodplains: 75 ac (30 ha) Streams: 3,265 linear ft (995 linear m)	Floodplains: 75 ac (30 ha) Streams: 3,265 linear ft (995 linear m)

<sup>96</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	HST Options			Conventional Improvements	
	Union Pacific Santa Ana–HST (to Anaheim)	LOSSAN Corridor– HST (to Anaheim)	LOSSAN Corridor–HST (to Irvine)	LOSSAN Corridor– Non-electric (Highest level of improvement to Irvine)	LOSSAN Corridor– Non-electric (Lowest level of improvement to Irvine)
<b>Biological Resources, Including Wetlands:</b> <sup>97</sup> Linear ft of non-wetland waters (waters), number of special-species (species)	Waters: 6,920 linear ft (2,109 linear m) Species: 9  Trains would travel in existing right-of-way within an urban area.	Waters: Less than 20,800 linear ft (6,340 linear m) Species: Fewer than 8  Trains would travel in existing right-of-way within an urban area.	Waters: 20,800 linear ft (6,340 linear m) Species: 8  Trains would travel in existing right-of-way within an urban area.	Waters: 20,800 linear ft (6,340 linear m) Species: 8  Trains would travel in existing right-of-way within an urban area.	Waters: 20,800 linear ft (6,340 linear m) Species: 8  Trains would travel in existing right-of-way within an urban area.
<b>Section 4(f) and 6(f) Resources:</b> <sup>98</sup> Number of resources rated high (potential direct effects)	Resources rated high: 3  Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.	Resources rated high: 2  Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.	Resources rated high: 5  Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.	Resources rated high: 7  Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.	Resources rated high: 7  Potential impacts would be limited due to the use of existing rail corridors in which few resources are found.

<sup>97</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>98</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

### 6.6.3 Orange County to Oceanside Alignment Options

All information presented is for the area from Irvine to Oceanside. This segment is shown in Figures 6.6-3a and 6.6-3b.

	Conventional (Non-Electric) Improvements—LOSSAN Corridor		
	Highest Level Improvements (I-5/LongTunnel/Double-Track)	Highest Level Improvements (Trabuco Creek/Long Tunnel/Double-Track)	Lowest Level Improvements (Trabuco Creek/Short Tunnel/Double-Track)
<b>Physical/Operational Characteristics</b>			
<b>Alignment Description</b>	The alignment would bypass San Juan Capistrano via an I-5 tunnel, include the long I-5 tunnel option through San Clemente and Dana Point, and complete double-tracking through Camp Pendleton. Station options considered in this segment include San Juan Capistrano, Trabuco Creek, San Clemente Amtrak, and Oceanside Transit Center.	The alignment would bypass the existing San Juan Capistrano alignment via Trabuco Creek, include the long tunnel option with station through San Clemente and Dana Point, and complete double-tracking through Camp Pendleton. Station options considered in this segment include San Juan Capistrano, Trabuco Creek, San Clemente Amtrak, and Oceanside Transit Center.	The alignment would bypass the existing San Juan Capistrano alignment via Trabuco Creek, include the short tunnel option through San Clemente and Dana Point, and complete double-tracking through Camp Pendleton. Station options considered in this segment include San Juan Capistrano, Trabuco Creek, San Clemente Amtrak, and Oceanside Transit Center.
<b>Length in miles (km)</b>	40.8 mi (65.7 km)	41 mi (66 km)	41.4 mi (66.6 km)
<b>Cost (dollars)</b>	\$1.82 billion	\$1.46 billion	\$1.13 billion
<b>Travel Time (min)</b>	26 min	28 min	28 min
<b>Ridership</b>	Would provide feeder service (non-electric portion of the system that would feed HST) to HST system. Alignment would eliminate station at San Juan Capistrano for intercity service.	Would provide feeder service (non-electric portion of the system that would feed HST) to HST system. Alignment would provide a new San Juan Capistrano station along Trabuco Creek.	Would provide feeder service (non-electric portion of the system that would feed HST) to HST system. Alignment would provide a new San Juan Capistrano station along Trabuco Creek.
<b>Constructability</b>	This alternative would require tunneling (approximately 12.7 mi [20.4 km]).	This alternative would require tunneling (approximately 8.8 mi [14.2 km]) and could cross some environmentally sensitive habitats.	This alternative would require tunneling (approximately 5.6 mi [9.0 km]) and cross some environmentally sensitive habitats.
<b>Operational Issues</b>	Beneficial. Would provide safer and more reliable operating conditions by providing full grade separations and removing tracks from the beach.		Beneficial. Would provide safer and more reliable operating conditions by grade separating much of the alignment, but could retain Dana Point curve.

	Conventional (Non-Electric) Improvements—LOSSAN Corridor		
	Highest Level Improvements (1-5/LongTunnel/Double-Track)	Highest Level Improvements (Trabuco Creek/Long Tunnel/Double-Track)	Lowest Level Improvements (Trabuco Creek/Short Tunnel/Double-Track)
<b>Potential Environmental Impacts</b>			
<b>Travel Conditions</b>	This alignment would provide the most improvement in travel times, allowing for double tracking of the entire segment. Consequences of this alignment would be the elimination of a station in San Juan Capistrano and the addition of a new station in San Clemente. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.	This alignment would provide improved travel times, allowing for double tracking of the entire segment. San Juan Capistrano would be served by a new station located along Trabuco Creek and a new station located in San Clemente. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.	This alignment would provide improved travel times, allowing for double tracking of the entire segment while keeping some of the scenic coastal route. San Juan Capistrano would be served by a new station located along Trabuco Creek, and the San Clemente Metrolink and Amtrak stations would be located at a single station along Avenida Pico. There would be ongoing speed restrictions through Capistrano Beach and potentially the Dana Point curve.
<b>Noise and Vibration:</b> <sup>99</sup> High, medium, and low potential impacts	<p>Low potential impacts.</p> <p>Minimal potential noise/vibration impacts as a result of extensive tunneling under existing transportation corridors. Would eliminate potential impact along coast by realigning the right-of-way. Would realign corridor away from historical buildings in San Juan Capistrano.</p>		<p>Low potential impacts.</p> <p>Minimal potential noise/vibration impacts as a result of extensive tunneling under existing transportation corridors, removing right-of-way from majority of coastal alignment. Some potential impact may still occur along the coast in Capistrano Beach. Would realign corridor away from historical buildings in San Juan Capistrano.</p>

<sup>99</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.



	Conventional (Non-Electric) Improvements—LOSSAN Corridor		
	Highest Level Improvements (I-5/LongTunnel/Double-Track)	Highest Level Improvements (Trabuco Creek/Long Tunnel/Double-Track)	Lowest Level Improvements (Trabuco Creek/Short Tunnel/Double-Track)
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Compatible.</p> <p>Environmental Justice: Minority populations are present at points along this alignment option.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>I-5 would avoid historical resources, and tracks would be removed from existing beach alignment.</p>	<p>Some incompatibility, but Trabuco Creek avoids historical resources.</p> <p>Environmental Justice: Minority populations are present at points along this alignment option.</p> <p>Community: Low potential impacts.</p> <p>Property: Medium potential impacts.</p> <p>Tracks would be removed from existing beach alignment.</p>	<p>Some incompatibility.</p> <p>Environmental Justice: Minority populations are present at points along this alignment option.</p> <p>Community: Low potential impacts.</p> <p>Property: Medium potential impacts.</p> <p>Potential impacts from increased frequencies of trains along Capistrano Beach.</p>
<b>Aesthetics and Visual Resources:</b> Number of viewing points and potential high contrast/impact areas	<p>Low potential impacts.</p> <p>Viewing points: 1.</p> <p>Potential beneficial impact for communities. Would remove tracks from beach alignment.</p>	<p>Low potential impacts.</p> <p>Viewing points: 1.</p> <p>Potential beneficial impact for communities. Medium potential impact on residential along Trabuco Creek. Would remove tracks from beach alignment.</p>	<p>Low potential impacts.</p> <p>Viewing points: 1.</p> <p>Potential beneficial impact for communities. Medium impact on residential along Trabuco Creek and Capistrano Beach. Would remove tracks from part of beach alignment.</p>
<b>Hydrology and Water Resources:</b> <sup>100</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	<p>Floodplains: 25 ac (10 ha)</p> <p>Streams: 2,475 linear ft (linear 754 m)</p>	<p>Floodplains: 5 ac (2 ha)</p> <p>Streams: 3,625 linear ft (linear 1,105 m)</p>	<p>Floodplains: 35 ac (14 ha)</p> <p>Streams: 4,020 linear ft (linear 1,225)</p>

<sup>100</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	Conventional (Non-Electric) Improvements—LOSSAN Corridor		
	Highest Level Improvements (I-5/LongTunnel/Double-Track)	Highest Level Improvements (Trabuco Creek/Long Tunnel/Double-Track)	Lowest Level Improvements (Trabuco Creek/Short Tunnel/Double-Track)
<b>Biological Resources, Including Wetlands:</b> <sup>101</sup> Ac (ha) of wetlands, linear ft (m) of non-wetland waters (waters), and number of special-status species (species).	Wetlands: 41 ac (17 ha) Waters: 6,105 linear ft (1,861 linear m) Species: 32  Tunneling would limit the potential impacts. Would eliminate potential coastal impacts by removing tracks from beach.	Wetlands: 35 ac (14 ha) Waters: 11,425 linear ft (3,483 linear m) Species: 32  Tunneling would limit the potential impacts. Would eliminate potential coastal impacts by removing tracks from beach.	Wetlands: 9 ac (4 ha) Waters: 17,325 linear ft (5,281 linear m) Species: 32  Tunneling would limit the potential impacts.
<b>Section 4(f) and 6(f) Resources:</b> <sup>102</sup> Number of resources rated high (potential direct effects)	Resources rated high: 8	Resources rated high: 8	Resources rated high: 9  Continued operation along Doheny State Beach.

<sup>101</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.

<sup>102</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

#### 6.6.4 Oceanside to San Diego Alignment Options

All information presented is for the area from Oceanside to San Diego. This segment is shown in Figures 6.6-4a and 6.6-4b.

		Conventional (Non-Electric) Improvements—LOSSAN Corridor				
		Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Highest Level Improvements (Short Trench/ Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
Physical/Operational Characteristics						
Alignment Description	Would include short trench and cover through downtown Carlsbad and downtown Encinitas, bypass Peñasquitos Lagoon and Del Mar with tunnel under I-5, tunnel under I-5 to shorten alignment by bypassing Miramar, and provide full-grade separation through San Diego. Station options considered in this segment include Solana Beach Transit Center, UTC, and San Diego Downtown Santa Fe Depot.	Would include short trench and cover through downtown Carlsbad and downtown Encinitas, bypass Peñasquitos Lagoon and Del Mar with tunnel under I-5, tunnel under UTC, and provide full grade separation through San Diego. Station options considered in this segment include Solana Beach Transit Center, UTC, and San Diego Downtown Santa Fe Depot.	Would include short trench and cover through Carlsbad and Encinitas, tunnel under Camino Del Mar and UTC, and provide full grade separation through San Diego. Station options considered in this segment include Solana Beach Transit Center, UTC, and San Diego Downtown Santa Fe Depot.	Would be at grade through Carlsbad and Encinitas with partial-grade separation, tunnel under Camino Del Mar and UTC, and provide full grade separation through San Diego. Station options considered in this segment include Solana Beach Transit Center, UTC, and San Diego Downtown Santa Fe Depot.	Would be at grade through Carlsbad and Encinitas, tunnel under Camino Del Mar and UTC, and be at grade through San Diego. Station options considered in this segment include Solana Beach Transit Center, UTC, and San Diego Downtown Santa Fe Depot.	
Length in miles (km)	36.4 mi (58.6 km)	37.2 mi (59.9 km)	37.2 mi (59.9 km)	37.2 mi (59.9 km)	37.2 mi (59.9 km)	
Cost (dollars)	\$2.04 billion	\$1.96 billion	\$1.77 billion	\$1.47 billion	\$1.19 billion	
Travel Time (min)	25 min	27 min	29 min	29 min	29 min	

	Conventional (Non-Electric) Improvements—LOSSAN Corridor				
	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
<b>Ridership</b>	Would provide a non-electric feeder service to HST system.	Would provide a non-electric feeder service to the HST system. Alignment would provide a new potential underground UTC station.	Would provide a non-electric feeder service to the HST system. Alignment would provide a new potential underground UTC station.	Would provide a non-electric feeder service to the HST system. Alignment would provide a new potential underground UTC station.	Would provide a non-electric feeder service to the HST system. Alignment would provide a new potential underground UTC station.
<b>Constructability</b>	Requires considerable earth moving from trenching and tunneling (approximately 12.2 mi [19.6 km]). Avoids tunneling under main commercial street in Del Mar.	Requires considerable earth moving from trenching and tunneling (approximately 10.5 mi [16.9 km]). Avoids tunneling under the main commercial street in Del Mar.	Requires considerable earth moving from trenching and tunneling (approximately 7.7 mi [12.4 km]).	Requires some earth moving from trenching and tunneling (approximately 6.2 mi [10.0 km]).	Requires some earth moving from trenching and tunneling (approximately 6.2 mi [10.0 km]).
<b>Operational Issues</b>	Beneficial. Reduces operational issues in Del Mar by eliminating bluff alignment. Overall speeds greatly improved by bypassing Soledad grade through Miramar and grade separation of crossings. Does not provide station at UTC.	Beneficial. Reduces operational issues in Del Mar by eliminating bluff alignment. Speeds improved by bypassing Soledad grade through Miramar and grade separation of crossings.	Beneficial. Eliminates operational issues in Del Mar by eliminating bluff alignment and providing the straightest, flattest alignment through Del Mar. Speeds improved by bypassing Soledad grade through Miramar and grade separation of crossings.	Beneficial. Eliminates operational issues in Del Mar by eliminating bluff alignment and providing the straightest, flattest alignment through Del Mar. Speeds improved by bypassing Soledad grade through Miramar and grade separation of crossings in San Diego. At-grade issues remain in Carlsbad and Encinitas.	Somewhat beneficial. Eliminates operational issues in Del Mar by eliminating bluff alignment and providing the straightest, flattest alignment through Del Mar. Ongoing reliability issues due to remaining grade crossings.

Conventional (Non-Electric) Improvements—LOSSAN Corridor					
	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
<b>Potential Environmental Impacts</b>					
<b>Travel Conditions</b>	Would improve travel times, allowing for double-tracking of the entire segment and grade separations through north San Diego County and San Diego. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.	Would improve travel times, allowing for double-tracking of entire segment and grade separations through north San Diego County and San Diego. This option would also provide for a potential station at UTC, serving the businesses of Sorrento Valley and students at UC-San Diego. The fully grade-separated corridor would improve traffic flow and reduce air pollution at existing rail crossings.		Would considerably improve travel times, allowing for double-tracking of the entire segment and grade separations through San Diego. This option would also provide for a potential station at UTC, serving the businesses of Sorrento Valley and students at UC San Diego.	Would considerably improve travel times, allowing for double-tracking of the entire segment and partial grade separations through San Diego. This option would also provide for a potential station at UTC, serving the businesses of Sorrento Valley and students at UC San Diego.
<b>Noise and Vibration:</b> <sup>103</sup> High, medium, and low potential impacts	Medium potential impacts.  Some noise/vibration would potentially continue to impact San Dieguito Lagoon and some residential areas. Could introduce new potential impacts along southern edge of San Dieguito Lagoon.		Low potential impacts.  Some noise/vibration would potentially continue to impact lagoon areas.	Low potential impacts.  Some noise/vibration would potentially continue to impact lagoons and some residential areas due to at-grade segments through Encinitas and Carlsbad.	Low potential impacts.  Noise/vibration would potentially continue to impact lagoons and some residential areas due to at-grade segments through Encinitas, Carlsbad, and San Diego.

<sup>103</sup> Generally, vibration is not a significant impact. However, sensitive and specific areas, such as historical structures and special habitats, could be affected.

	Conventional (Non-Electric) Improvements–LOSSAN Corridor				
	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
<b>Land Use and Planning, Communities and Neighborhoods, Property, and Environmental Justice</b>	<p>Some incompatibility.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>Although there is a high concentration of minority populations in the corridor because the alignment is largely in an existing right-of-way, the potential impacts may be reduced.</p>	<p>Some incompatibility.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>Although there is a high concentration of minority populations in the corridor because the alignment is largely in an existing right-of-way, the potential impacts may be reduced.</p>	<p>Some incompatibility.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>Although there is a high concentration of minority populations in the corridor because the alignment is largely in an existing right-of-way, the potential impacts may be reduced.</p>	<p>Some incompatibility.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>Although there is a high concentration of minority populations in the corridor because the alignment is largely in an existing right-of-way, the potential impacts may be reduced.</p>	<p>Some incompatibility.</p> <p>Environmental Justice: Low potential minority population impacts.</p> <p>Community: Low potential impacts.</p> <p>Property: Low potential impacts.</p> <p>Although there is a high concentration of minority populations in the corridor because the alignment is largely in an existing right-of-way, the potential impacts may be reduced.</p>

	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Conventional (Non-Electric) Improvements—LOSSAN Corridor			
		Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
<b>Aesthetics and Visual Resources:</b> Number of viewing points and potential high contrast/impact areas	Medium potential impacts. Viewing points: 1.  Medium potential impacts on communities due to elevated rail structure along southern edge of San Dieguito Lagoon.	Medium potential impacts. Viewing points: 1.  Medium potential impacts on communities due to elevated rail structure along southern edge of San Dieguito Lagoon.	Low potential impacts. Viewing points: 1.  Beneficial potential impact on communities.	Low potential impacts. Viewing points: 1.  Low potential impact on communities.	Low potential impacts. Viewing points: 1.  Low potential impact on communities.
<b>Hydrology and Water Resources:</b> <sup>104</sup> Potential impacts and associated ac (ha) of floodplains, and linear ft (m) of streams within potential impact study areas	Floodplains: 120 ac (49 ha) Streams: 6,230 linear ft (1,899 linear m)	Floodplains: 100 ac (40 ha) Streams: 6,365 linear ft (1,940 linear m)	Floodplains: 140 ac (57 ha) Streams: 6,155 linear ft (1,876 linear m)	Floodplains: 140 ac (57 ha) Streams: 6,155 linear ft (1,876 linear m)	Floodplains: 140 ac (57 ha) Streams: 6,155 linear ft (1,876 linear m)

<sup>104</sup> The hydrology and water resources study area is defined as 100 ft (30 m) on each side of the alignment centerline.

	Conventional (Non-Electric) Improvements–LOSSAN Corridor				
	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
<b>Biological Resources Including Wetlands:</b> <sup>105</sup> Ac (ha) of wetlands, linear ft (m) of non-wetland waters (waters), and number of special-status species (species)	Wetlands: 881 ac (357 ha) Waters: 56,437 linear ft (17,202 linear m) Species: 112  Would improve tidal flow within coastal lagoons by replacing structures across lagoons to eliminate or reduce fill. Would bypass Peñasquitos Lagoon and remove existing fill along it, but could introduce new indirect potential impacts along southern edge of San Dieguito Lagoon because would pass edge of lagoon.	Wetlands: 874 ac (354 ha) Waters: 53,962 linear ft (16,448 linear m) Species: 112  Would improve tidal flow within coastal lagoons by replacing structures across lagoons to eliminate or reduce fill. Would bypass Peñasquitos Lagoon and remove existing fill along it, but could introduce new indirect potential impacts along southern edge of San Dieguito Lagoon because would pass edge of lagoon.	Wetlands: 907 ac (367 ha) Waters: 46,750 linear ft (14,249 linear m) Species: 118  Would improve tidal flow within coastal lagoons by replacing structures across lagoons to eliminate or reduce fill.	Wetlands: 892 ac (361 ha) Waters: 45,990 linear ft (14,018 linear m) Species: 118  Would improve tidal flow within coastal lagoons by replacing structures across lagoons to eliminate or reduce fill.	Wetlands: 892 ac (361 ha) Waters: 45,990 linear ft (14,018 linear m) Species: 118  Would improve tidal flow within coastal lagoons by replacing structures across lagoons to eliminate or reduce fill.

<sup>105</sup> The biological resources and wetlands study area is defined as 1,000 ft (305 m) for urban areas, 0.25 mi (0.40 km) for undeveloped areas, and 0.5 mi (0.80 km) for sensitive areas on each side of alignment centerline.



	Conventional (Non-Electric) Improvements—LOSSAN Corridor				
	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel I-5/ Grade Sep.)	Highest Level Improvements (Short Trench/Peñasquitos Bypass/Tunnel UTC/ Grade Sep.)	Highest Level Improvements (Short Trench/Tunnel Camino Del Mar & UTC/ Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/Grade Sep.)	Lowest Level Improvements (At Grade/Tunnel Camino Del Mar & UTC/At Grade)
<b>Section 4(f) and 6(f) Resources:</b> <sup>106</sup> Number of resources rated high (potential direct effects)	Resources rated high: 15  Potential impacts on several state beaches would be limited due to use of existing rail corridors.	Resources rated high: 14  Potential impacts on several state beaches would be limited due to use of existing rail corridors.	Resources rated high: 14  Potential impacts on several state beaches would be limited due to use of existing rail corridors.	Resources rated high: 14  Potential impacts on several state beaches would be limited due to use of existing rail corridors.	Resources rated high: 14  Potential impacts on several state beaches would be limited due to use of existing rail corridors.

<sup>106</sup> The 4(f) and 6(f) resources study area is defined as 900 ft (274m) on each side of the alignment centerline.

### 6.6.5 Los Angeles to San Diego Station Options

Station Name (Alignment)		Discussion
High-Speed Rail Stations		
<b>Los Angeles International Airport</b>		
<b>Los Angeles International Airport</b> (MTA Subdivision)		<p>The LAX station would be a below-grade station, adjacent to airport terminals, and would permit easy access by a potential people mover or shuttle, or by walking. It would have direct connections to regional bus transit services and would be the only HST station directly serving western Los Angeles County. This underground terminal station would cost \$336 million.</p> <p>A station at LAX would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, Section 4(f) and 6(f) lands, and public utilities; and low to moderate potential impacts on hydrology and water quality (mostly groundwater). It would be located within a minority population.</p>
<b>Southern Los Angeles County (Gateway Cities)</b>		
<b>Norwalk</b> (UPRR)		<p>The selection of the alignment between Los Angeles and Orange County would determine the preferred station location that would serve the 17 cities that comprise the Gateway Cities of south Los Angeles County, which include the Cities of Vernon, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, and La Mirada. The Norwalk UPRR site would be an elevated station located near the Imperial Highway. There is no existing passenger rail connection (about 1 mi [2 km] east of the Green Line LRT terminus). It has existing bus connections and good freeway access. The station would cost \$28.7 million.</p> <p>A station in Norwalk along the UPRR Santa Ana Branch Line would have low potential impacts on biological resources, paleontological resources, hydrology and water quality, public utilities, and Section 4(f) and 6(f) lands; low to moderate potential impacts on cultural resources; and moderate potential visual impacts since it would be an elevated station. It would be located within a minority population, in addition to requiring some non-residential displacements.</p>
<b>Norwalk</b> (LOSSAN)		<p>The selection of the alignment between Los Angeles and Orange County would determine the preferred station location that would serve the 17 cities that comprise the Gateway Cities of south Los Angeles County, which include the Cities of Vernon, Commerce, Montebello, Pico Rivera, Santa Fe Springs, Norwalk, and La Mirada. The Norwalk LOSSAN site would be at Norwalk Metrolink station with direct connectivity to the regional commuter rail service. It would be a bus transit hub for the area, and would be well served by I-5 and the Imperial Highway. An HST station would require considerable improvements to the existing station, including lengthening platforms to accommodate the longer trains. Station improvements would cost \$10.0 million.<sup>107</sup></p> <p>An HST station in Norwalk at the existing Metrolink station would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, hydrology and water quality, public utilities, Section 4(f) and 6(f) lands at Zimmerman Park, and would be located within a minority population.</p>

<sup>107</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
<b>Central Orange County</b>	
<b>Anaheim Transportation Center</b> (LOSSAN)	<p>The Anaheim Transportation Center is an existing transit hub with high connectivity for central Orange County. The station is a bus transit hub and serves existing Amtrak and Metrolink Commuter Rail services. Depending on the alignment selected between Los Angeles and Anaheim, there are several design options for the orientation of the HST station at the transportation center. An HST station along the existing LOSSAN corridor would require considerable improvements to the existing station, including lengthening platforms to accommodate the longer trains, and would cost \$10.0 million.<sup>108</sup> For the dedicated UPRR Santa Ana Branch alignment option, a full HST terminal station would be required. The terminal station would be configured underground and would cost \$336 million.</p> <p>The station in Anaheim would have low potential impacts on biological resources, visual resources, cultural and paleontological resource, public utilities, cultural resources, and Section 4(f) and 6(f) lands; and moderate potential impacts on hydrology and water quality, potentially affecting 15 ac (6 ha) of floodplain. The site is located within a minority population.</p>
<b>Southern Orange County</b>	
<b>Irvine Transportation Center</b> (LOSSAN)	<p>The master site plan for the Irvine Transportation Center indicates that this station area will develop into a transit-oriented environment serving as a station stop for improved Pacific Surfliner service, Metrolink Commuter service, and a potential southern terminus to the proposed HST network in Orange County. The Irvine Transportation Center is an existing transit hub for bus routes with high connectivity for South Orange County. An HST station would require considerable improvements to the existing station, including lengthening platforms to accommodate the longer trains. In addition, certain amenities would be required, since this would be a potential terminus station. The station improvements would cost \$10.0 million.<sup>109</sup></p> <p>The station in Irvine would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, public utilities, hydrology and water quality (affecting 5 ac [2 ha] of floodplain), and Section 4(f) and 6(f) lands at the former El Toro Marine Corps Air Station. The site is located within a minority population.</p>
<b>Conventional Service Stations</b>	
<b>Southeast Los Angeles County</b>	
<b>Norwalk</b> (LOSSAN)	<p>The Norwalk LOSSAN site would be at Norwalk Metrolink station and would provide direct connectivity to the regional commuter rail service. It is a bus transit hub for the area and is well served by I-5 and the Imperial Highway. This station would serve the 17 Gateway Cities of southeast Los Angeles County.</p> <p>An HST station in Norwalk at the existing Metrolink station would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, hydrology and water quality, public utilities, and Section 4(f) and 6(f) lands at Zimmerman Park. It would be located within a minority population.</p>

<sup>108</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

<sup>109</sup> Shared-use station includes modification to existing platforms and passenger facilities only within existing right-of-way. Does not include full express and stopping track configuration assumed for HST stations on dedicated high-speed lines.

Station Name (Alignment)	Discussion
<b>North &amp; Central Orange County</b>	
<b>Fullerton Amtrak Station</b> (LOSSAN)	<p>The Fullerton Amtrak Station would continue to serve improved Amtrak Pacific Surfliner and transcontinental trains, providing connecting service to HST in either Norwalk or LAUS.</p> <p>The station in Fullerton is located within a minority population and would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, public utilities, and Section 4(f) and 6(f) lands; and high potential impacts on hydrology and water quality as a result of the high potential for erosion.</p>
<b>Anaheim Transportation Center</b> (LOSSAN)	<p>The Anaheim Transportation Center is an existing transit hub with high connectivity for central Orange County. The station is a bus transit hub and serves existing Amtrak and Metrolink Commuter Rail services.</p> <p>The station in Anaheim would have low potential impacts on biological resources, visual resources, cultural and paleontological resource, public utilities, and Section 4(f) and 6(f) lands; and moderate potential impacts on hydrology and water quality (affecting 15 ac [6 ha] of floodplain. The site is located within a minority population.</p>
<b>Santa Ana Amtrak Station</b> (LOSSAN)	<p>The Santa Ana Amtrak Station would provide service to an improved Pacific Surfliner, Metrolink Commuter, and proposed CenterLine LRT system currently under design. Amtrak service would be used to provide a connection to the HST network at Anaheim, Norwalk, or LAUS.</p> <p>The station in Santa Ana would have low potential impacts on biological resources, visual resources, cultural (specifically historical structures) and paleontological resources, hydrology and water quality, public utilities, and Section 4(f) and 6(f) lands. The site is located within a minority population.</p>
<b>Southern Orange County</b>	
<b>Irvine Transportation Center</b> (LOSSAN)	<p>The master site plan for the Irvine Transportation Center indicates that this station area will develop into a transit-oriented environment serving as a station stop for improved Pacific Surfliner service and Metrolink Commuter service, and is a potential southern terminus to the proposed HST network in Orange County. The Irvine Transportation Center is an existing transit hub for bus routes with high connectivity for southern Orange County.</p> <p>The station in Irvine would have low potential impacts on biological resources, visual resources, cultural and paleontological resources, public utilities, hydrology and water quality (affecting 5 ac [2 ha] of floodplain), and Section 4(f) and 6(f) lands at the former El Toro Marine Corps Air Station. The site is located within a minority population.</p>
<b>San Juan Capistrano</b> (LOSSAN)	<p>The San Juan Capistrano station would continue to serve improved Amtrak Pacific Surfliner and Metrolink Commuter trains, providing connecting service to HST in either Irvine, Anaheim, Norwalk, or LAUS.</p> <p>The station in San Juan Capistrano would have low potential impacts on biological resources, visual resources, hydrology and water quality, public utilities, and Section 4(f) and 6(f) lands. It is located within a minority population. It would have high potential impacts on paleontological resources (formations with high fossil sensitivity) and on cultural resources (six known archeological sites).</p>

Station Name (Alignment)	Discussion
<b>Trabuco Creek</b> (LOSSAN)	<p>Depending on the alignment chosen through San Juan Capistrano, a new station may be constructed along the Trabuco Creek alignment. This station would be located in a trench adjacent to Trabuco Creek, west of the existing Amtrak station.</p> <p>Due to its proximity to the existing downtown San Juan Capistrano Amtrak station, many of the potential environmental impacts would be similar. Potential biological and hydrological impacts may result due to the location of the station adjacent to Trabuco Creek.</p>
<b>San Clemente Amtrak</b> (LOSSAN)	<p>Two potential station locations are being considered along the alignment options for the LOSSAN corridor options. Along the short tunnel option, a station is being considered adjacent to Avenida Pico, just north of the existing Metrolink station. The second station location would be along the I-5 tunnel option, where the proposed alignment crosses Avenida Pico, just north of I-5. These stations would replace the existing Amtrak and Metrolink stations, allowing for both the Surfliner and Metrolink to continue to serve San Clemente along the potential new railroad alignments.</p> <p>Station sites in San Clemente would be located within a minority population and would have low potential impacts on biological resources, visual resources (trenched stations), public utilities, and Section 4(f) and 6(f) lands and moderate potential impacts on geology (difficulty in excavations), hydrology and water quality (affecting 5 ac [2 ha] of floodplain), and cultural resources (specifically historical structures).</p>
<b>San Diego County</b>	
<b>Oceanside Transit Center</b> (LOSSAN)	<p>The Oceanside Transit Center is an existing transit hub with high connectivity for northern San Diego County. The station is a bus transit hub and serves existing Amtrak service and both Coaster and Metrolink Commuter Rail services.</p> <p>The station in Oceanside is located within a minority population and would have low potential impacts on public utilities, Section 4(f) and 6(f) lands, and visual resources; and moderate potential impacts on biological resources (affecting wildlife movement corridors, threatened and endangered species, and species of special concern), wetlands and non-wetland waters, hydrology and water quality (potential for erosion), and cultural resources (specifically historical structures).</p>
<b>Solana Beach Amtrak Station</b> (LOSSAN)	<p>Solana Beach Amtrak station is an existing transit hub with high connectivity for northern and central San Diego County. The station is a bus transit hub and serves existing Amtrak and Coaster Commuter Rail services. It is currently the primary station for UC San Diego students, faculty, and staff and serves the biotech industries in Sorrento Valley and the Del Mar race track.</p> <p>The station in Solana Beach is located within a minority population and would have low potential impacts on visual resources, public utilities, and Section 4(f) and 6(f) lands; and moderate potential impacts on biological resources (threatened and endangered species and species of special concern), wetlands and non-wetland waters, hydrology and water quality (potential for erosion), and cultural resources (specifically historical structures).</p>
<b>University Towne Centre</b> (LOSSAN)	<p>The University Towne Centre (UTC) station site would be a deep-bore station, and the location would depend on the design option to tunnel under UTC to bypass the majority of the existing Sorrento Valley and Rose Canyon rail alignment. UTC is a densely developed portion of San Diego. The station would also be served by the Coaster commuter rail service and could have a direct connection to the regional LRT service.</p> <p>The station would be located within a minority population and would have low potential impacts on biological resources, visual resources, public utilities, and cultural resources; and moderate potential impacts on geology (seismic hazards and difficult excavations), hydrology and water quality (erosion potential), and Section 4(f) and 6(f) lands at Mandell Weiss Eastgate Park.</p>

Station Name (Alignment)	Discussion
<b>San Diego Downtown–Santa Fe Depot</b> (LOSSAN)	<p>The Santa Fe Depot is an existing transit hub in the heart of downtown San Diego with high connectivity for coastal San Diego County. The station is a bus transit hub for several transit services and serves existing Amtrak and Coaster Commuter Rail operations. It is a major transfer station for San Diego's trolley network.</p> <p>The station is located within a minority population and would have low potential impacts on visual resources, hydrology and water quality, and Section 4(f) and 6(f) lands; and moderate potential impacts on biological resources (threatened and endangered species, species of special concern, and non-wetland waters), geology (seismic hazards and difficulty in excavations), public utilities (electrical facilities), and cultural resources (specifically historic structures).</p>